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BIM Report 2016

SMART CITIES & BIM Technologies

Effects of BIM on project LIFECYCLE PHASES

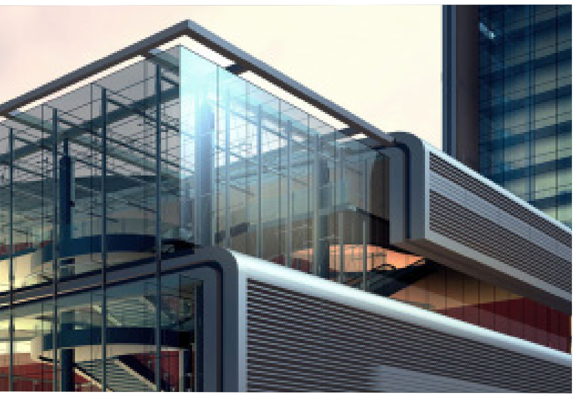
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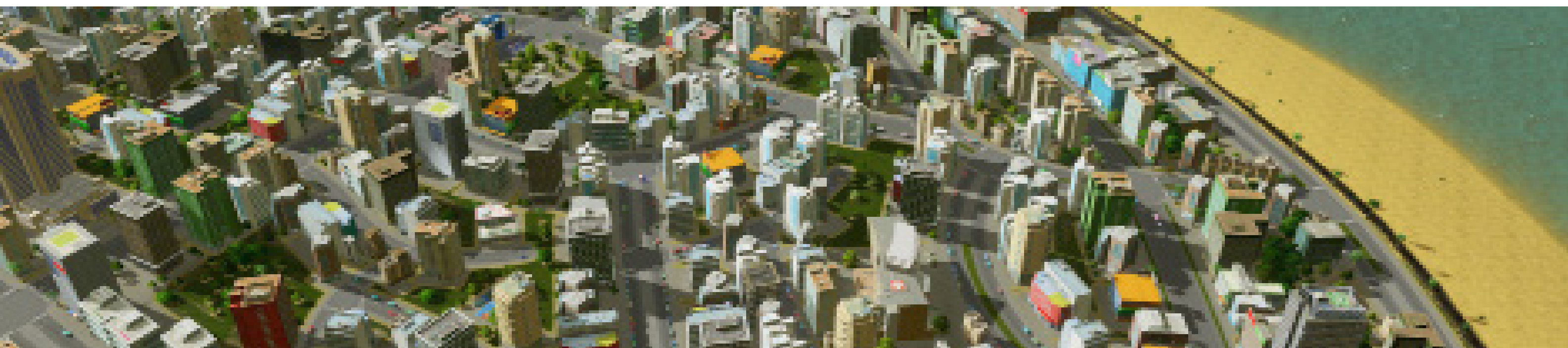






Cover photo: Moscow smart city by Zaha Hadid Architects





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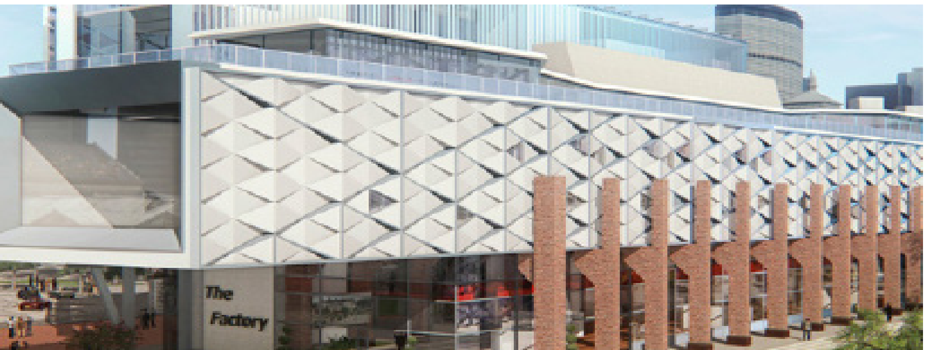
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BELAL SUCCAR

INTRODUCTION

The pace is certainly picking up! I am very pleased to announce that Mr. Omar Selim has been appointed as the BIM Dictionary's Arabic Language Editor.

Praise be to Allaah. We would like to inform you that the Bim Arabia team is working on translating the Bim Dictionary of Dr. Bilal Succar to standardize terminology among the researchers in the field.

The BIM Dictionary is an online resource for practitioners and researchers to freely use. It includes hundreds of research-based Dictionary Items: terms with their descriptions, abbreviations, and synonyms.

Each Dictionary Item has its own page so it can be easily referenced in industry documents, academic papers, and websites. The BIM Dictionary is part of an expanding Modular Language which includes Competency Items, Model Uses, and other 'Knowledge Blocks' derived from the conceptual BIM Ontology. The BIM Dictionary is hosted at http://BIMdictionary.com/

The Dictionary will be translated by Mr. Omar Selim. He is the Co-founder of BIMarabia, a Bim Manager of 10 years and a super active BIM blogger. He will be supported by Ms.Radwa Hassan, a Civil Engineer with a passion for BIM, English phonology and web design. With the pending introduction of Arabic, the BIM Dictionary will be able to serve a rapidly expanding BIM community in the Middle East and North Africa!

So, a very big welcome to both Omar and Radwa to the expanding Editorial Team!

Bilal Succar
Director of ChangeAgents |
Founder of the BIMe Initiative

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BIMarabia Issue No. 14



OMAR SELIM



Hany S. Omar



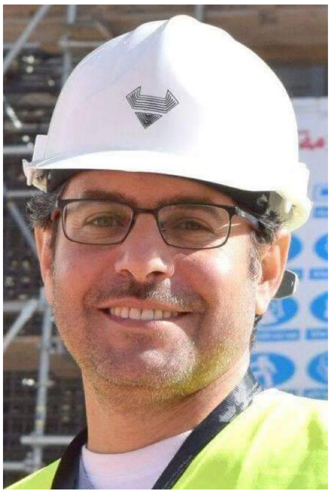
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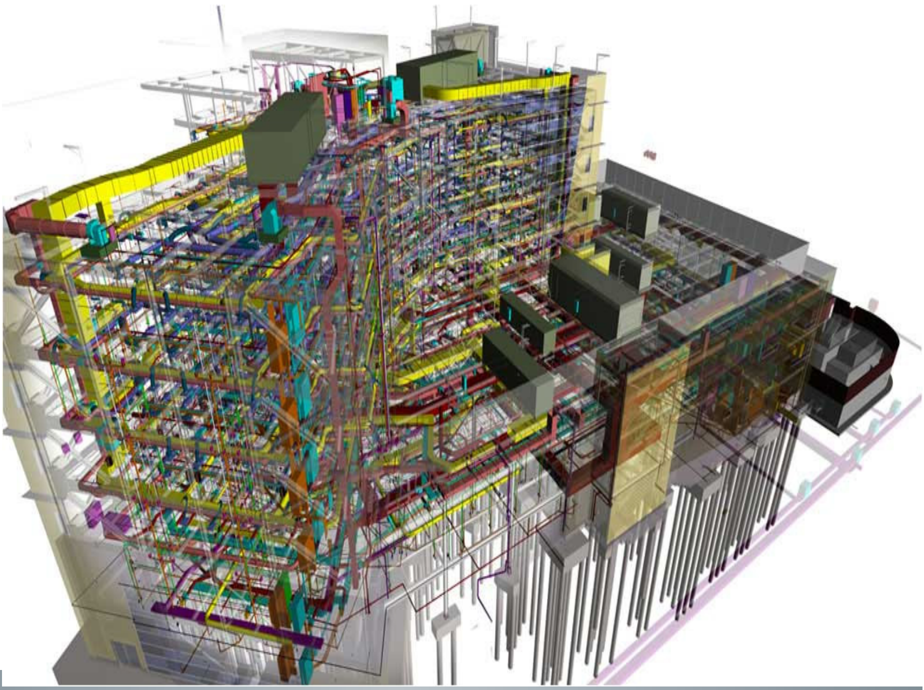


Kamal Shawky



Ammar Eltawm

Using BIM to automate the processof MONITORING Construction Process



> In 2014, in the UK, 1.2 million construction workers were employed to contribute 103 billion pounds ($ 129 billion) in national income.

Building Systems in BIM

It is known that the construction industry is one of the main pillars of the development of the economies of developed and developing countries.
In 2014, in the UK, 2 million construction workers were employed to contribute 103 billion pounds ($ 129 billion) in national income. Any improvement or development in the field of construction is positively reflected not only on governments but also on individuals, but for many decades the construction sector has inherited many of the challenges and problems that have always troubled the development.

One of the most important factors in the success of any project is the successful management of the project. The most important criteria leading a successful management is to make the right decisions at the right time and therefore the information must be correct and accurate, otherwise the decisions would be wrong to lead the project to failure.

In order to obtain information on the progress of work during the implementation phase, the vast majority of project managers follow the traditional system, which depends primarily on the human element. The engineers and surveyors of the site write down their notes on the movement of the work and submit the work manually using the paper book and pen for the purpose of the work of a monthly or weekly report on the basis of which is recognized on the status of progress of the work, which subsequently require important decisions and critical to keep pace with the development of business with the pre-programmed program. He found that this process requires a lot of time, labor, effort and late do not reach the accuracy required most of the time. For example, in a vital project, the previous manual system was followed by an explanation for business development information. The report of the project manager stated that the business progress rate is 30% and the target is 55%, but the real business progress is 60%.

Therefore, the project manager made immediate decisions to rearrange the distribution of labor, equipment and materials to cover the delay. The report stated that the delay is 25% while the real position of the project is 55% with a 5% advance on the schedule. Therefore, the decisions of the project manager led to material burdens and loss of time, which in turn led to the actual delay of the project, which did not benefit progress achieved by the project, all because of the report, which contains information is incorrect and even misleading. This is in addition to the loss of customer confidence in the accuracy of the reports.
After careful study, the researchers found that the system of manual follow-up to modernize the position of business development contains many challenges and problems, for example: The accuracy of the information collected from the site depends on the experience and accuracy of the collection and the need for sufficient time to collect this information, Several days and even weeks in large projects. In addition to the overlap of more than one team to complete the report. As the information collected from the site is



Laser scanned point cloud

passed to another team in the office of the site to the latter enter this data to know the percentage of progress of work. Therefore, the latter's familiarity with the site and the implementation processes and its ability to interpret the hand-written data is an important factor in determining the accuracy of the report. The preparation of the report requires a number of days and may be up to two weeks and this shows that the report, which was prepared in a large period of time gives an indication of the progress of work for a period of time earlier.

Therefore, one of the most important challenges for the preparation of business development reports is that the reports are prepared for a period of time earlier and decisions after this period of time in most cases do not work. Therefore, the need to produce a report that does not require more than one day was a necessary and urgent need to develop the area of construction.

Therefore, the concern of researchers and governments was to find effective solutions to this dilemma and did not stop attempts to develop from the sixties of the last century. However, all solutions were incomplete and inadequate. Until the emergence of Pem and evolution in this form amazing in the last two decades, which led researchers to search for solutions through the system Bem.

In 2009, Frederick Bouchia developed a system of automatic control and modernization of the traffic of construction works. Where he developed a logarithm based mainly on the work of laser scanning of the site to work a three-dimensional model of the cloud system. And then compare this last model with the four-dimensional BIM model, in order to automatically update the site and minimize human intervention to reduce the chances of human error on the results of the report. The efforts of researchers did not stop there.

They have developed easier and less expensive systems. In 2014, Dimitrov and Vard developed a logarithm that could identify materials for a course to build a three-dimensional model similar to the BIM model by identifying images taken from the site. Then, the developed system makes a comparison with the four-dimensional model of the BIM in order to identify the business position. The accuracy of this system ranged from 92.1% for reinforced concrete to 92.3% for earthwork, soil and 100% for carpentry, glass and marble. The average accuracy of this automatic system was calculated to reach 97.1%, which is very satisfactory compared to the traditional manual system. Researchers are continuing research and development to maximize the benefits of modern technology.

REFERENCES

Dimitrov, M., Golparvar-Fard. (2014). Vision-based material recognition for automated monitoring of construction progress and generating building information modelling from unordered site image collections, Journal of Advanced Engineering and Information, 28 (1), pp. 37–49

Kim, Y., Oh, W., Cho, K and Seo, W. (2008). A PDA and wireless web-integrated system for quality inspection and defect management of apartment housing projects. Automation in construction, 17(2), pp. 163-179

Office of National Statistics. (2015). 20102010https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/uklabourmarket/latest [Accessed in 28 No vember 2016

Omar, H., Dulaimi, M. (2015). Using BIM to automate construction site activities, Proceeding of conference Building Information Modeling (BIM) in design, construction and operations, Bristol, UK. 139, pp. 45-58 [Accessed in 28 .[November 2016



Hany S. Omar

BUILDING INFORMATION MODELING



BIM is changing the way we build, collaborate and operate

Remarkably, construction industry is considered to be a role model in establishing required infrastructure for continuous urban development, and life quality improvement.
Consequently, production development in construction sector, whether on the individual or the project level, has an essential value, in which its impact extend more than in industrial sector. Experimental evidences showed that using integrated techniques caused construction production development, as in the improved construction material development, also development in used techniques, caused production improvement significantly
Based on the previous mentioned facts, developing CAD (Computer Aided Design) and afterword developing Three-Dimensional Visualization was and still a huge step forward in construction industry because of the significant decrease in the working hours, during design phase. In addition to remarkable design accuracy and its creation. This development has led to a more sophisticated architectural designs, which required developing techniques to facilitate data processing, in construction sector. That's why a various type of software have been developed, to meet these requirements. Each one has been dedicated to deal with specific discipline, a part of the whole project, and without any data from other disciplines,

With reference to this used method from one side, and increasing in architectural design sophisticated level from the other side, data entry process has become a tremendous time-consuming process. Consequently, the need for data exchange between concerned software has become a wide demand; and it took a place by developing IEIS (Integrated Engineering Information Systems), which can be defined as a package of individual programs, and connected data base through a certain platform that run by a certain programming language and work as an intermediate between the programs that forms the information system

Despite significant progress that took place in that field, each system of integrated information systems has been created to handle a specific criteria. As a result, the users had to install all the program packages of the integrated engineering information systems on their computers and to study all these programs, beside the fact that users still have to perform all desired changes themselves. Fortunately, developing Conceptual Architectural Intelligence through the 80s has a wide impact on developing information systems, during this period, which has a role modeling achieving a certain technique, which is lately known as (Building Information Modeling) or BIM.
variety of concerned references has defined the last concept based on their understanding of the terms, and the way



Autodesk BIM for MEP

it is used. For instance, the American standard for BIM (NBIMS2007) national institute for building science, stated that BIM is digitalizing physical and functional properties for a certain project. So, it is a shared knowledge source for the project information, which forms a solid foundation to take decisions, during project life cycle. It is the same definition that is used by American Institute for Architects (AIA), in the document (E.202, 2008), while it is defined by contractor guide for BIM from American General Contractor Union (AGC), as "Producing and using computer programed model, to simulate building and operating a certain facility ". The result model, which is BIM, is a digital figure for the facility, signified as a smart and full of data, defining the components used in it, and using the terms that has a changeable value, which you can use to analyze a lot of data and directions, according to the users different requirements, which help to generate information that can be used to take decisions, and improve facility handing process.

In the same time, in his book (Kummel 2008), he defines BIM as a virtual modeling for the building, produced by computer and specialized program, which may contain all required data to construct a building, and it is a general term that can name the model (or models), which represent the physical properties for the project, in addition to the ability to call it on all the continued information in that model. When BIM is used in a certain sentence, the flow meaning of that phrase defines that acronym to be (Building Information modeling), or (Building Information Model),

"The development of Conceptual Artificial Intelligence during the 1980s had an important impact on the development of information systems

representing BIM for the project may contain any (or every), two or three or four dimensions, (for time frame), or Five dimensions (cost Information), or other dimensions, (Energy or green building or facility managements)

While in the book titled BIM guide, information modeling guides owners, managers, design engineers and contractors, which is considered the basic reference to understand building information modeling. Eastman et al 2011 states BIM as follows:

We use the term BIM, as an act or a phrase, to describe tools, operations or techniques, available by digital documents, readable by machines, about the building, its performance & its time schedule, and what follows of operations So, the term BIM refers to effectiveness. And to describe the result of the modeling effectiveness, we use the term BIM. As for the researcher point of view, BIM, basically is formation of actual reality, through the virtual reality, by merging design with data base, based on values, to present a variety of extremely important information to simulate every component, which help creating new dimensions to represent, to reach ideal solutions for all building aspects. (Design, duration, cost, green building, facility management, safety and risk managements), before going through the actual construction resources.

REFERENCES

Chapman R. E. and Butry D. T., "Measuring and improving the productivity of the US construction industry: issues, challenges, and opportunities", national institute of standards and technology, 2008

Lytle, A. M., "A framework for object recognition in construction using building information modeling and high frame rate 3d imaging", Ph.D., department of civil and environmental engineering, the Faculty of the Virginia polytechnic institute and state university, 2011

Risch T., "Integrated engineering information systems", department of computer science, Linköping University, Sweden

The National Institute of Building Sciences, "The national building information modeling standard (NBIMS)", 2007

The American Institute of Architects (AIA), "Building Information Modeling Protocol Exhibit", document E202, 2008

The Associated General Contractors of America (AGC), "Contractors' Guide to BIM", 1st edition, 2006

Kymmell W., "Building Information Modeling (Planning and Managing Construction Projects with 4D CAD and Simulations)", the McGraw-Hill companies Inc., 2008

Eastman C., Teicholz P., Sacks R., and Liston K., "BIM Handbook: A guide to building information modeling for owners, managers, designers, engineers, and contractors", John Wiley and Sons Inc., .2011



Kamel ElShekhly



BELAL SUCCAR

Effects of BIM on Project LIFE CYCLE PHASES

Episode 10



A construction project passes through multiple phases from inception to demolition. These phases are typically referred to as Project Lifecycle Phases (PLPs) and include pre-construction activities like programming, cost planning as well as post-construction activities like occupancy and facility maintenance. Lifecycle phases can be delineated in a few ways but I have personally adopted a simplified subdivision as follows:

Construction projects pass through three major lifecycle phases: Design [D], Construction [C] and Operations [O]. These phases are also subdivided into sub-phases (Table 1) which are in turn further subdivided into activities, sub-activities and tasks.

As an example of further subdivision, the Design phase [D] includes Architectural, Structural and Systems Design sub-phase [D1], which includes an Architectural Design activity [D1.1], which includes the Conceptualisation sub-activity [D1.1a] which lastly includes a 3D Modelling task [D1.1a.01]. The usefulness of these subdivisions will not be too evident in this blog post but just remember that BIM implementations can and will affect construction projects at Phase, Task and everything in between. For now we'll just focus on the effects of BIM on Phases and I'll discuss the effects of BIM on smaller lifecycle subdivisions in later posts.

Table 1: Stages of the project life cycle and sub-stages

Design Phase	Construction Phase	Operations Phase
D1: conceptualisation, programming and cost planning	C1: construction planning and construction detailing	O1: occupancy and operations
D2: architectural, structural and systems design	C2: construction, manufacturing and procurement	O2: asset management and facility maintenance
D3: analysis, detailing, coordination and specification	C3: commissioning, as-built and handover	O3: decommissioning and major re-programming

BIM Stage 1: Object-Based Modelling

As a reminder, BIM implementation is initiated through the deployment of an 'object-based 3D parametric software tool' similar to ArchiCAD®, Revit®, Digital Project® and Tekla®. At Stage 1, users generate single-disciplinary models within either design [D], construction [C] or operation [O] – the three Project Lifecycle Phases. These models - like architectural design models [D] and duct fabrication models [C] - are primarily used to automate the generation and coordination of 2D documentation and 3D visualisations. Other deliverables of Stage 1 models include basic data exports (ex: door schedules, concrete quantities, FFE costs,...) and light-weight 3D models (ex: 3D DWF, 3D PDF, NWD, etc...) which have no modifiable parametric attributes. However, the 'semantic' nature of object-based models and their 'hunger' for early and detailed resolution of design and construction matters encourage 'fast-

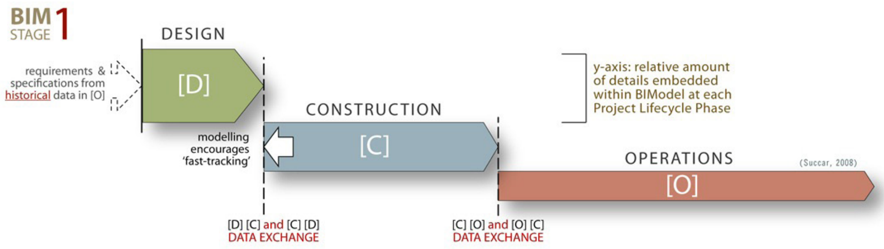


Fig. 1. Project Lifecycle Phases at BIM Stage 1 – linear model

> *The construction projects undergo three stages of "major life cycle": Design [D], Creation [C], Operations [O].*

tracking' of Project Lifecycle Phases (Fig. 1). Figure 1 above depicts how object-based modelling encourages fast-tracking: when a project is still executed in a phased manner yet design and construction activities are overlapped to save time [2]. That is, after achieving maturity within Stage 1 implementations, BIM players will acknowledge the benefits of engaging other design and construction players with similar modelling capabilities. Such acknowledgement and subsequent action will lead them to BIM Stage 2, model-based collaboration.

BIM Stage 2: Model-Based Collaboration

Having developed single-disciplinary modelling expertise through Stage 1 implementations, Stage 2 players actively collaborate with other disciplinary players. This may occur in many technological ways according to each player's selection of BIM software tools.

Model-based collaboration can occur within one or between two Project Lifecycle Phases. Examples of this include the Design-Design interchange of architectural and structural models [DD], the Design-Construction interchange of structural and steel models [DC] and the Design-Operations interchange of architectural and facility maintenance models [DO]. Stage 2 maturity also alters the granularity of modelling performed at each lifecycle phase as higher-detail construction models move forward and replace (partially or fully) lower-detail design models (Fig. 2).Figure 2 above depicts how model-based collaboration is a factor in instigating fast-tracking and changing relative modelling intensity within each lifecycle phase. The overlap depicted is driven by construction players increasingly providing design-related

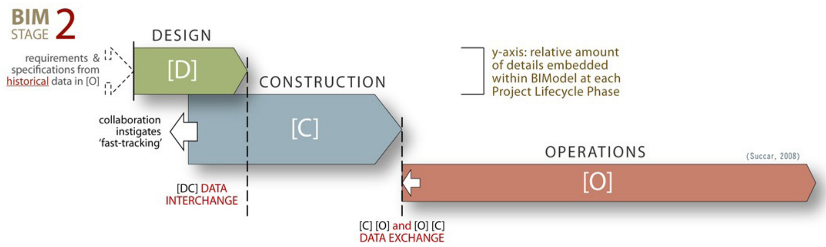


Fig. 2. Project Lifecycle Phases at BIM Stage 2 – linear model

services as part of their Stage 2 offerings and design players increasingly adding construction and procurement information into their design models. Also, changes in semantic richness across lifecycle phases occur as detailed construction and fabrication models (ex: steel detailing and duct fabrication models) partially replace the more generic upstream structural and mechanical design models.

BIM Stage 3: Network-Based Integration

In this stage semantically-rich integrated models are created, shared and maintained collaboratively across Project Lifecycle Phases. This integration can be achieved through model server technologies (using proprietary, open or non-proprietary formats), single / integrated / distributed / federated databases [1,3] and/or SaaS (Software as a Service) solutions [4]. From a process perspective, synchronous interchange of model and document-based data cause project lifecycle phases to overlap extensively forming a phase-less process (Fig.3). Figure 3 Below depicts how network-based integration causes 'concurrent construction': a term used when "all project activities are integrated and all aspects of design, construction, and operation are concurrently planned to maximize the value of objective functions while optimising constructability, operability and safety" [2].

In summary, object-based modelling will first blur the lines separating different project lifecycle phases. As model-based collaboration takes hold, lifecycle players start moving into each other's territory. Finally, as network-based integration becomes the norm, design, construction and operations overlap extensively if not totally.

Note on terms used within Figures

- A BIM data exchange is when a BIM player exports or imports data that is neither structured nor computable. A typical example of data exchange is the export of 2D CAD drawings out of 3D object-based models resulting in significant loss of geometric and semantic data.
- A BIM data interchange (or interoperable exchange) is when a BIM player exports and imports data that is structured and computable by another application. Interchanges assume 'adequate interoperability' between the sender and receiver systems.

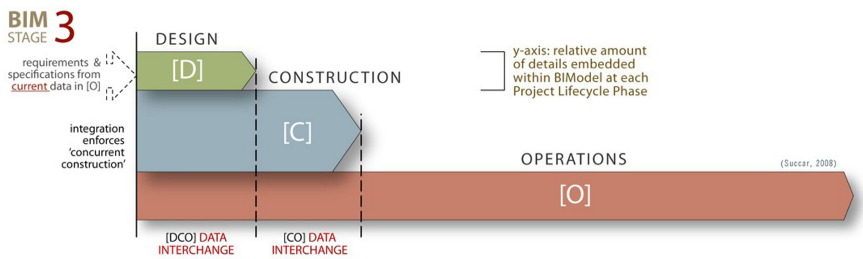


Fig. 3. Project Lifecycle Phases at BIM Stage 3 – linear model

REFERENCES

Bentley, Does the Building Industry Really Need to Start Over - A Response from Bentley to Autodesk's BIM-Revit Proposal for the Future, http://www.laiserin.com/features/bim/bentley_bim_whitepaper.pdf, last accessed July 12, 2008

A. Jaafari, Concurrent Construction and Life Cycle Project Management, Journal of Construction Engineering and Management 123 (4) (1997) 427-.436

J. Liaserin, Building Information Modeling - The Great Debate, http://www.laiserin.com/features/bim/index.php, last accessed July 12, 2008

P. Wilkinson, SaaS-based BIM, [4] http://extranetevolution.com/2008/04/saas-based-bim/, last accessed July 12, 2008 (link updated March 24, (2015



BELAL SUCCAR

Episode 11

The Difference between BIM CAPABILITY BIM MATURITY

The Story

Let's start with a short story about two AEC organisations that – once upon a time – decided to adopt Building Information Modelling. Both organisations were mid-sized firms, operated within the same market and had the same mix of disciplines. Both were able to undertake large Design and Construct (Design and Build) projects of value exceeding $200m within the Health Sector. But this is where the similarities ended:

The Yellow Organisation decided to invest substantial energy and money to acquire object-based software (say Revit®, Tekla® or Vico®). This decision came after a group of enthusiastic and technology-savvy staff succeeded in convincing management to trial BIM. These 'champions' then organised and undertook the necessary training as recommended by their BIM software retailer and supplemented their learning by sieving through countless online forums. After a handful of months, a few setbacks and a couple of successful pilot projects, this group of individuals – now considered superheroes by some of their peers and computer-hugging fools by others – stood ready to implement what they've learned across the organisation. New BIM components where generated on-the-job and novel standards/processes started to slowly push out existing CAD practices. The management, now excited about the commercial possibilities of the new deliverables, instructed its marketing people to inject BIM images and labels into Yellow's corporate website and to start informing potential clients about their new abilities.

The Blue Organisation invested substantial time and energy in investigating, developing and then gradually implementing an overall BIM strategy, tailored training plans, modelling standards and workflow protocols. Internal and external help were sought to communicate, train as well as educate staff [1] about BIM technologies and processes. The management team, after leading this implementation effort from day zero, succeeded in getting all staff enthusiastic and engaged in developing BIM products and processes. They continuously conducted internal assessments to ensure that their BIM productivity is sufficiently stable and that they can predictably and uniformly deliver high-quality models and drawings. Convinced that BIM is the only efficient way to deliver services, they allowed their marketing people to inject BIM images and labels into Blue's corporate website and to start informing potential clients about their new abilities.

End of the story...

Now, from an onlooker's point of view (a client for example) both organisations appear equally qualified, just as able to deliver the promise of BIM....But they're not equally qualified – far from it. These two organisations demonstrate a significant problem in identifying the difference between BIM Capability - the ability to generate BIM deliverables and services, from BIM Maturity - the extent, depth, quality, predictability and repeatability of these BIM deliverables and services.

Let's have another look at the above organisations using two different lenses:

Capability is thus a notion quite different to Maturity...I'll quickly expand on this a bit more by re-discussing BIM Capability before directly jumping into the more intricate topic of BIM Maturity:

BIM Capability, a reminder

As explored in Episode 8, three 'capability' Stages are needed to pass from pre-BIM status to IPD. These Stages represent revolutionary changes (as opposed to evolutionary mutations) and are characterised by reaching a milestone or achieving minimum proficiency. For example, an organisation is considered to have reached BIM Capability Stage 1 by the relative easiness of deploying an object-based software. BIM Capability Stage 2 is reached when an organisation undertakes model-based multi-disciplinary collaboration. Finally, BIM

#	Yellow Organisation	Blue Organisation
1	Uses Object-based software tools	Also uses Object-based software tools
2	Can collaborate internally using multi-disciplinary object-based models	Same as left...
3	Can deliver at least one large BIM project of construction value exceeding $200m	Same as left...
4	Has experience in the Health Sector	Same as left...
Quick Conclusion: *the Yellow and Blue organisation have very similar BIM Capability*		

#	Yellow Organisation	Blue Organisation
1	Bottom-Up initial BIM approach	Top-Down initial BIM approach
2	Champion-lead implementation	Management-lead implementation
3	No evidence of overall BIM strategy	Overall Strategy preceded implementation
4	No evidence of internal communication about BIM implementation efforts	There is evidence of internal communication as part of the BIM implementation effort
5	Standards were learned, developed and extended on the go	Standards and workflows where readied prior to wide implementation
6	Evidence of change-resistance (cynicism)	Evidence of wide-spread enthusiasm
7	No evidence of skill/knowledge assessment	Evidence of skill/knowledge assessment
Quick Conclusion: *the Blue organisation has higher BIM Maturity than the Yellow one (this conclusion will be explained in more detail in the next one or two blog posts)*		

Capability Stage 3 is reached when an organisation undertakes network-based, interdisciplinary model integration. In essence, the three BIM Stages are useful in identifying the minimum abilities of organisations and project teams but are not that useful in analysing or comparing how well they model, collaborate or integrate their deliverables.

Organisation which are not aware of the above capability progression usually refer to themselves as generically 'BIM able' as soon as they deploy a few copies of ArchiCAD, Tekla or Bentley Architecture. So how can individuals, organisational teams, organisations and project teams rate their own performance or that of their potential partners or competitors? How can clients filter out BIM wash from BIM reality? They need – we all need – some kind of 'tool' that can be applied to define, measure and hopefully improve these BIM abilities [2].

BIM Maturity

The concept of Maturity is not new and have existed for some time in other industries but the most potent representation of this concept came from the software industry's Capability Maturity Model.

CMM is actually a 'process improvement framework' originally intended as a tool to evaluate the ability of government contractors to perform a software project. It was developed in the late 80s for the benefit of the US Department of Defence [3]. It's successor, the more comprehensive Capability Maturity Model Integration (CMMI), continues to be developed and extended by the Software Engineering Institute, Carnegie Mellon University.

Capability Maturity Models identify a set of standardised process improvement levels (or maturity levels) which allow implementers to achieve significant business benefits. Research into CMM has already identified the correlation between process maturity and business performance [4]. The use of maturity models is thought to lead to increased productivity and Return On Investment (ROI) as well as reduced costs and post-delivery defects [5]&[6].

The 'original' CMM is specific to the software industry and is not applicable to construction as it does not address supply chain issues and its maturity levels do not account for the different phases of a project lifecycle [7]. Although there are a few – some are extensive efforts - which focus on the construction industry, there is no comprehensive model that can be applied to BIM, its implementation stages, players, deliverables or its effect on project lifecycle phases.I'll leave it here now....In the next couple of Episodes, I'll discuss currently available and applicable Maturity Models (including the one by NBIMS) followed by a new BIM Maturity Index which I think you'll find interesting...

Table 1: Comparing the two organisations using a BIM Capability lens

Table 2: Comparing the two organisations using a BIM Maturity lens

REFERENCES

Education is about learning for oneself," and training is about learning for the sake of someone else" as beautifully summarised by Dr. Megan Squire after analysing this Monthly Review article

The full quality axiom dictates that "what cannot be defined, cannot be measured; what cannot be measured cannot be improved, and what cannot be improved will eventually deteriorate" (Dr. Daniel Meade, bettermanagement.com

Hutchinson, A., & Finnemore, M. (1999). Standardized process improvement for construction enterprises. Total Quality Management, 10, 576-583

Lockamy III, A., & McCormack, K. (2004). The development of a supply chain management process maturity model using the concepts of business process orientation. Supply Chain Management: An Int. Journal, 9(4), 272-27

Jaco, R. (2004). Developing an IS/ICT management capability maturity framework, Proceedings of the 2004 annual research conference of the South African institute of computer scientists and information technologists on IT research in developing countries. Stellenbosch, Western Cape, South Africa: South African Institute for Computer Scientists and Information Technologists

Paulk, M. C., Weber, C. V., Garcia, S. M., Chrissis, M. B., & Bush, M. (1993). Key Practices of the Capability Maturity Model - Version 1.1 (Technical Report): Software Engineering Institute, Carnegie Mellon University

Sarshar, M., Haigh, R., Finnemore, M., Aouad, G., Barrett, P., Baldry, D., et al. (2000). SPICE: a business process diagnostics tool for construction projects. Engineering Construction & Architeural Management, 7(3), 241-250

BIM PERFORMANCE MEASUREMENT



BELAL SUCCAR

Episode 12

After introducing the general differences between BIM Capability and BIM Maturity in Episode 11 , I'll briefly discuss some of the currently available and applicable maturity models[1]. The intention is to understand what other organisations and individuals have already achieved in this space and try to pin-point an appropriate performance-measurement model that can be adopted or modified to assess BIM competencies [2].

Why is this important? If BIM implementations by teams and organizations are to achieve the much touted increase in productivity, these implementations need to be measured, compared against some sort of industry benchmarks and – most importantly – independently certified. Without measurement, organizations offering design, construction or operations' services have no basis on which to improve their processes and deliverables. Without benchmarks and certificates, clients aiming to employ these organizations have no consistent way of understanding their BIM competencies.

It is really a no-brainer that the AECO industry needs a specialized tool to assess BIM implementations in order to identify real BIM abilities from flagrant BIM wash. What requires real thought is [ONE] what BIM 'metrics' should this tool measure, [TWO] how to perform these measurements, and [THREE] how to certify measurement results so they can be trusted and depended upon for selecting project partners and/or improving BIM performance. This lengthy post will address a small part of the first question...

The initial step in identifying suitable metrics would be through searching for an existing and suitable performance measurement tool - rather than developing a new one from scratch - and then improve upon it. So, let's have a quick look at some existing and applicable tools:

Applicable Maturity Models and Tools

A 'maturity model' is simply a set of performance improvement levels that can be achieved by an organisation or a project team. There are many maturity models which are relevant to our quest but I'll only mention a few of them below:

All the above 'maturity models' are relevant to the construction industry (there are many others as well) but only two so far have claimed the ability to measure BIM-specific maturity: NBIMS' I-CMM and Indiana University's BIM Proficiency Matrix [8]. Since Indiana University's effort is fairly new and is not yet well documented, I will only review the I-CMM tool below:

A quick focus on the NBIMS maturity effort

Let's start with the definition: the U.S. National Building Information Model Standard™ (NBIMS) establishes "standard definitions for building information exchanges to support critical business contexts using standard semantics and

Table 1. Sample Maturity Models of relevance to BIM

1	COBIT, Control Objects for Information & related Technology – Information Systems Audit & Control Association (ISACA) & the IT Governance Institute (ITGI) .
2	CMMI, Capability Maturity Model Integration - Software Engineering Institute/ Carnegie Melon
3	CSCMM, Construction Supply Chain Maturity Model - Vaidyanathan & Howell (2007)
4	I-CMM, Interactive Capability Maturity Model developed as part of the National BIM Standard (NBIMS) Version 1 Part 1 - a project of the National Institute for Building Sciences (NIBS), buildingSMARTalliance™ - weblink.
5	Indiana University BIM Proficiency Matrix - weblink (MS Excel File)
6	Knowledge Retention Maturity Levels - Arif, Egbu, Alom and Khalfan (2009) [4]
7	LESAT, Lean Enterprise Self-Assessment Tool - Lean Aerospace Initiative (LAI) at the Massachusetts Institute of Technology (MIT) - weblink
8	P3M3, Portfolio, Programme and Project Management Maturity Model – Office of Government Commerce (UK) - weblink
9	P-CMM®, People Capability Maturity Model v2 – Software Engineering Institute / Carnegie Melon - weblink
10	(PM)², Project Management Process Maturity Model - Kwak & Ibbs (2002) [5]
11	SPICE, Standardised Process Improvement for Construction Enterprises - Research Centre for the Built and Human Environment, University of Salford – Hutchinson & Finnemore (1999) [6]
12	Supply Chain Management Process Maturity Model and Business Process Orientation (BPO) maturity model - Lockamy III & McCormack (2004) [7]

ontologies...[to be]..implemented in software". NBIM Standard Version 1 – Part 1 proposes a Capability Maturity Model (CMM) for "users to evaluate their business practices along a continuum or spectrum of desired technical level functionality... [and to measure] the degree to which a building information model implements a mature BIM Standard"[9].

There are two versions of NBIMS' CMM. The first is a static table identifying 11 Areas of Interest (AOI) measured against 10 Levels of increasing maturity (Fig. 1). The second is the Interactive Capability Maturity Model (I-CMM), a multi-tab Microsoft Excel® workbook based on the static table and employing a point score against each AOI.

Fig.1. NBIMS CMM Chart (NBIMS-US v3 Section 5.2)

The initial step in identifying suitable metrics would be through searching for an existing and suitable performance measurement tool

Maturity Level	A Data Richness	B Life-cycle Views	C Roles Or Disciplines	G Change Management	D Business process	F Timeliness/ Response	E Delivery Method	H Graphical Information	I Spatial Capability	J Information Accuracy	K Interoperability/ IFC Support
1	Basic Core Data	No Complete Project Phase	No Single Role Fully Supported	No CM Capability	Separate Processes Not Integrated	Most Response Info manually re-collected - Slow	Single Point Access No IA	Primarily Text - No Technical Graphics	Not Spatially Located	No Ground Truth	No Interoperability
2	Expanded Data Set	Planning & Design	Only One Role Supported	Aware of CM	Few Bus Processes Collect Info	Most Response Info manually re-collected	Single Point Access w/ Limited IA	2D Non-Intelligent As Designed	Basic Spatial Location	Initial Ground Truth	Forced Interoperability
3	Enhanced Data Set	Add Construction/ Supply	Two Roles Partially Supported	Aware of CM and Root Cause Analysis	Some Bus Process Collect Info	Data Calls Not In BIM But Most Other Data Is	Network Access w/ Basic IA	NCS 2D Non-Intelligent As Designed	Spatially Located	Limited Ground Truth - Int Spaces	Limited Interoperability
4	Data Plus Some Information	Includes Construction/ Supply	Two Roles Fully Supported	Aware CM, RCA and Feedback	Most Bus Processes Collect Info	Limited Response Info Available In BIM	Network Access w/ Full IA	NCS 2D Intelligent As Designed	Located w/ Limited Info Sharing	Full Ground Truth - Int Spaces	Limited Info Transfers Between COTS
5	Data Plus Expanded Information	Includes Constr/Supply & Fabrication	Partial Plan, Design&Constr Supported	Implementing CM	All Business Process(BP) Collect Info	Most Response Info Available In BIM	Limited Web Enabled Services	NCS 2D Intelligent As-Builts	Spatially located w/Metadata	Limited Ground Truth - Int & Ext	Most Info Transfers Between COTS
6	Data w/Limited Authoritative Information	Add Limited Operations & Warranty	Plan, Design & Construction Supported	CM Capability	Few BP Collect & Maintain Info	All Response Info Available In BIM	Full Web Enabled Services	NCS 2D Intelligent And Current	Spatially located w/Full Info Share	Full Ground Truth - Int And Ext	Full Info Transfers Between COTS
7	Data w/ Mostly Authoritative Information	Includes Operations & Warranty	Partial Ops & Sustainment Supported	Implemented	Some BP Collect & Maintain Info	All Response Info From BIM & Timely	Full Web Enabled Services w/IA	3D - Intelligent Graphics	Part of a limited GIS	Limited Comp Areas & Ground Truth	Limited Info Uses IFC's For Interoperability
8	Completely Authoritative Information	Add Financial	Operations & Sustainment Supported	Implementing CM and Root Cause Analysis	All BP Collect & Maintain Info	Limited Real Time Access From BIM	Web Enabled Services - Secure	3D - Current And Intelligent	Part of a more complete GIS	Full Computed Areas & Ground Truth	Expanded Info Uses IFC's For Interoperability
9	Limited Knowledge Management	Full Facility Life-cycle Collection	All Facility Life-Cycle Roles Supported	CM and RCA capability implemented	Some BP Collect&Maint In Real Time	Full Real Time Access From BIM	Netcentric SOA Based CAC Access	4D - Add Time	Integrated into a complete GIS	Comp GT w/Limited Metrics	Most Info Uses IFC's For Interoperability
10	Full Knowledge Management	Supports External Efforts	Internal and External Roles Supported	Implementing CM & RCA and feedback	All BP Collect&Maint In Real Time	Real Time Access w/ Live Feeds	Netcentric SOA Role Based CAC	nD - Time & Cost	Integrated into GIS w/ Full Info Flow	Computed Ground Truth w/Full Metrics	All Info Uses IFC's For Interoperability

NBIMS' I-CMM is based on the concept of **Minimum BIM;** that is, a project needs to achieve a minimum total score of maturity for it to be considered 'true BIM'. When it was first released, the NBIM Standard, version 1 stated that "one should obtain a minimum score of 20 [points -weighted average] in order to consider true BIM maturity". It however stressed that the minimum score is not fixed but is "dependent on the date the [the I-CMM tool] is used". The minimum score can thus change yearly or "as the rhetorical bar is raised and owners demand more from the models being delivered" [10]. In fact, in the newer version of the Excel tool (v1.9), the Minimum BIM score has since been changed to 30 and lately to 40 points.

Limitations within the NBIMS I-CMM tool

NBIMS' maturity model and tool are still in their early days of developmentand may yet change significantly. However, both the model and tool have significant limitations which I will briefly discuss below [11]:

The I-CMM tool has been designed to be used as an "internal tool...[to]...determine the level of maturity of an individual BIM project as measured against a set of weighted criteria agreed to be desirable in a Building Information Model"[12][13]. I-CMM focuses primarily on measuring BIM information management and "should not be used as a benchmark for any other metrics" [14] including those related to architectural, engineering, construction and management. Also, I-CMM is not intended to be used as a "tool to compare BIMs or BIM implementations" [15].

In addition to the above structural limitations, the I-CMM's scoring system can theoretically generate different results (certificates) for the same BIM project if the tool is employed by different users or at different times. This is highlighted in how NBIMS 'allows' those who use the tool to modify AOI weighting according to their specific requirements (see page 79 of NBIMS v1, part 1). This variability in AOI's weightings coupled with a 'date-sensitive' Minimum BIM score limit the tool's reliability as well as its usability as an industry-wide, market-independent measurement tool.

The need for a comprehensive tool

If one spends enough time and energy to analyse the many strength and shortfalls of available maturity models, s/he soon realizes what is missing: a specialized BIM Capability and Maturity tool that can be used internally by organisation and externally by independent assessors, can measure all key metrics related to BIM, has a consistent scoring system and is equally applicable across markets, disciplines and organisational sizes.

Of course, it is not realistic to expect organizations to independently develop their own measurement tools and impose them on all others. It is also impractical to ask industry players to rely on tools developed by other industries and are unsuitable for measuring BIM. Finally, it is not useful to adopt existing tools that – although developed for B IM but - can neither measure all BIM indicators nor are consistent in their measurement.

REFERENCES

[1] The term 'model' in this post denotes 'knowledge models' not 'object-based models' as typically associated with BIM.

[2] BIM Competencies are the generic abilities that teams and organizations need to acquire as they adopt and improve upon their BIM technologies, processes and policies. These competencies include technical (e.g. exchanging model data) & non-technical abilities (e.g. virtual team management) but all are important to move from Pre-BIM to IPD through a systematic and measurable approach. BIM Competencies are grouped in sets which are employed to establish either Capability or Maturity benchmarks. I'll discuss BIM Competencies in a future post.

[3] Vaidyanathan, K., & Howell, G. (2007). Construction Supply Chain Maturity Model - Conceptual Framework, International Group For Lean Construction (IGLC-15). Michigan, USA.

[4] Arif, M., Egbu, C., Alom, O., & Khalfan, M. M. A. (2009). Measuring knowledge retention: a case study of a construction consultancy in the UAE. Engineering, Construction and Architectural Management, 16(1), 92-108.

[5] Kwak, Y. H., & Ibbs, W. C. (2002). Project Management Process Maturity (PM)2 Model. ASCE, Journal of Management in Engineering, 18(3), 150-155.

[6] Hutchinson, A., & Finnemore, M. (1999). Standardized process improvement for construction enterprises. Total Quality Management, 10, 576-583.

[7] Lockamy III, A., & McCormack, K. (2004). The development of a supply chain management process maturity model using the concepts of business process orientation. Supply Chain Management: An International Journal, 9(4), 272-278.

[8] Indiana University BIM Proficiency Matrix includes 8 categories measured against 4 maturity/proficiency levels. The matrix appears to focus on the accuracy and richness of the digital model (as an end-product) and has little focus on the process of creating that model. More information is available at http://bit.ly/iuBIM. Thank you to Dr. Umit Isikdag (University of Salford - UK) for bringing this effort to my attention.

[9] NIST. (2007). National Building Information Modeling Standard - Version 1.0 - Part 1: Overview, principles and Methodologies: National Institute of Building Sciences (Page 75).

[10] Same as above – Page 72

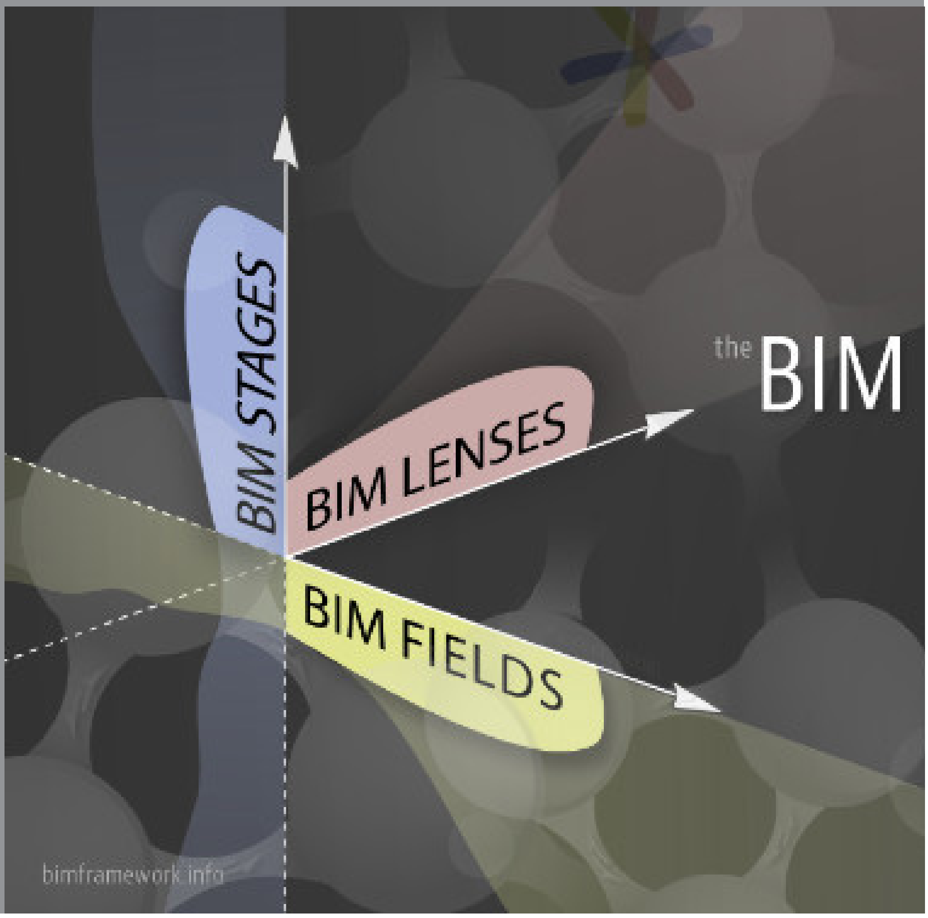
[11]I will be reviewing the NBIMS CMM and I-CMM in more detail as part of my upcoming chapter 'BIM Maturity Matrix' in the Handbook of Research on Building Information Modeling and Construction Informatics: Concepts and Technologies (http://bit.ly/BIMhandbook).

[12] See AECbytes Viewpoint #33 (December 6, 2007), http://bit.ly/AECbytes1.

[13] Suermann, P. C., Issa, R. R. A., & McCuen, T. L. (2008). Validation of the U.S. National Building Information Modeling Standard Interactive Capability Maturity Model 12th International Conference on Computing In Civil and Building Engineering, October 16-18. Beijing, China.

[14] NIST. (2007). National Building Information Modeling Standard - Version 1.0 - Part 1: Overview, principles and Methodologies: National Institute of Building Sciences (Page 80).

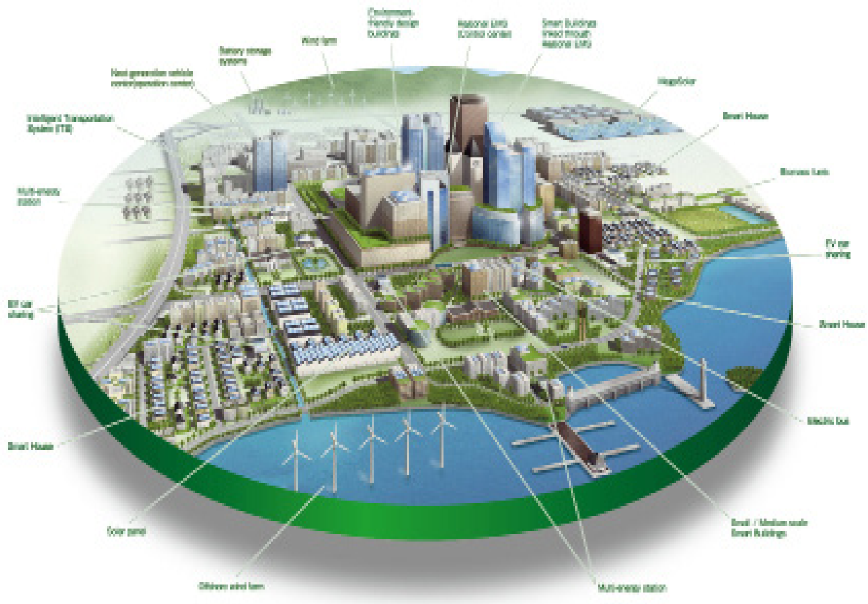
[15]Same as endnote 10.8.





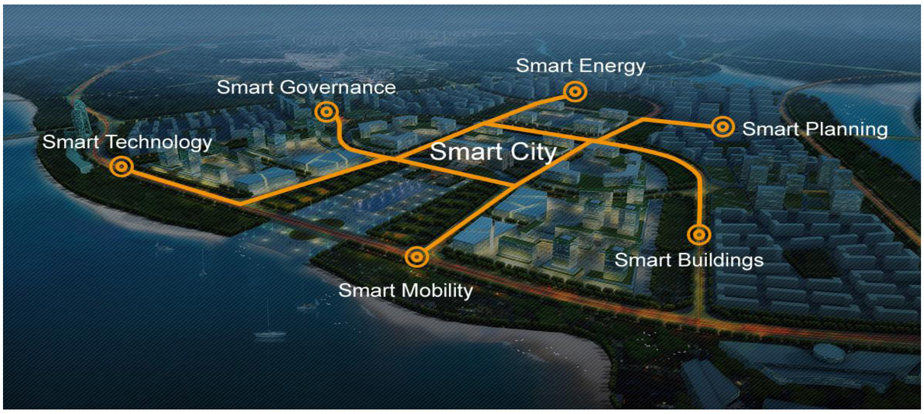
SMART CITIES & BIM TECHNOLOGY

AYMAN KANDEEL



Cities are the driving force in generating economic growth in the world. Around the world, challenges are rising and more people are concentrated in certain places, causing poor distribution of populations because of overcrowdedness due to the poor distribution over other areas, taking into account the outdated infrastructure, resulting in a rapid increase in resource consumption and emissions. The main challenge in studying cities around the world is to provide better service to current and future citizens, taking into account global competition, global rankings and the well-being of the people.

The term Smart city is not a marketing campaign or a name for a political echo, but a series of solutions to a dangerous and urgent situation that is facing the world today. Smart cities use information technology in the areas of infrastructure to reduce the cost of conservation and conservation of natural resources while providing a better living environment for the population. Various sectors - including transport, housing, health care - have been developed to become more intelligent, followed by energy, water, drainage and other sectors.



Sustainability

The world is moving towards the use of renewable energy solutions as well as providing the main energy sources to support everyday life. Smart City technology is an essential element in the development and planning of major cities in the world and has a significant impact on a sustainable future for the world.



Building Information Modeling and Geographic Information Systems

As we can see from the chart, the continuous development of data collection, statistics and the creation of a broad database using GIS is linked to 3D models and specifications to create an open, scalable BIM base.

BIG Data for Smarter Cities

BIM technology is the key to making cities smarter, as well as their importance in integrating the individual information of each building on a wider scale with geographic systems information and linking it to the life cycle of the building, infrastructure or urban planning. This information is processed by several specialized teams. Hence, the BIM technology offers many long-term benefits as the buildings are not isolated or treated as individual units but are integrated and linked to the city's infrastructure, roads, housing, utilities, heating, water, cooling, electricity networks, etc. Buildings and cities in the form of massive data.

Challenges for Smarter Cities

The main challenge for the application of smart cities and linking the three elements mentioned above is not only how to obtain data and information, but the biggest challenge is how to analyze large data and obtain results that are used to organize the process and how to formulate it. It mimics the reality of continuous scalability.

Civil Information Modeling (CIM)

In the application of smart city technology, the term civil information modeling appears. The goal is to establish and maintain the infrastructure by applying the BIM technology during design and maintenance through municipalities, and owners of public facilities and facilities to obtain intelligent infrastructure, intelligent road networks, And then get a smart city.

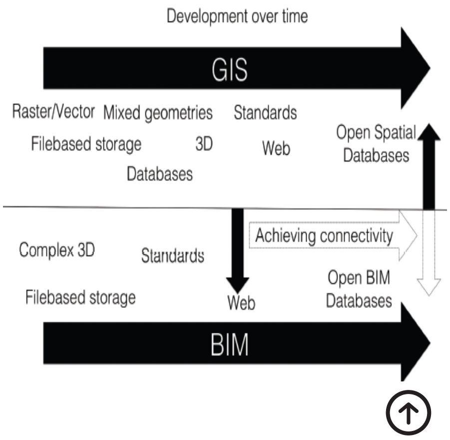
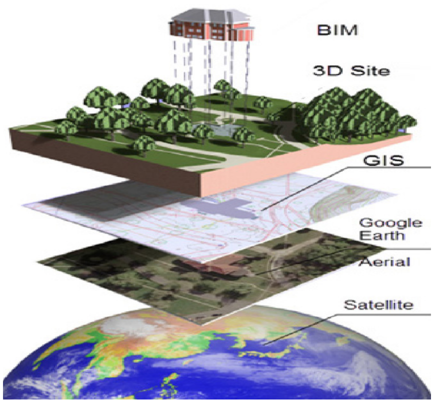


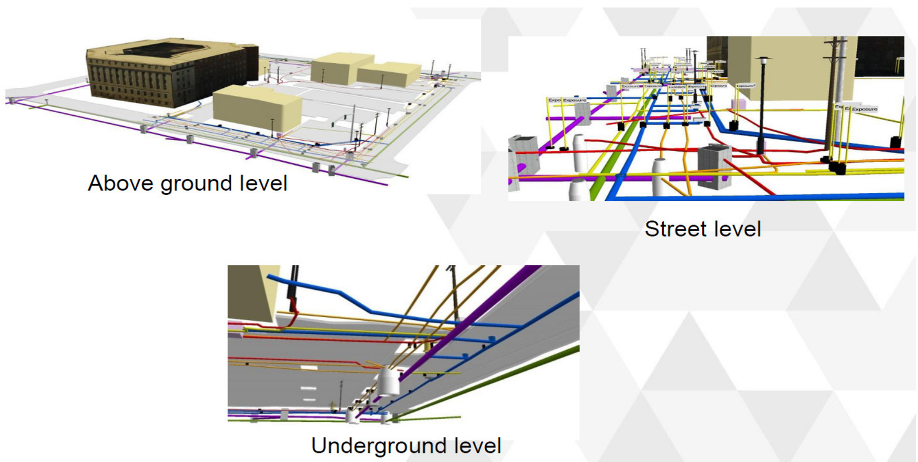
Fig. Achieving connectivity between GIS and BIM, Ulf Mansson

Geographic Information Systems (GIS)

It is a technology designed to monitor, collect and analyze all kinds of geographic information and represent the results of these analyzes with real elements such as roads, land, levels, heights, trees, rivers and others. This information is monitored through the satellite aerial image technology, which is linked to coordinates x, y, z and gives real information of the place has a spatial reference .







REFERENCES

Paul Doherty, President & CEO, The Digit Group, Inc., http://www.thedigitgroupinc.com/

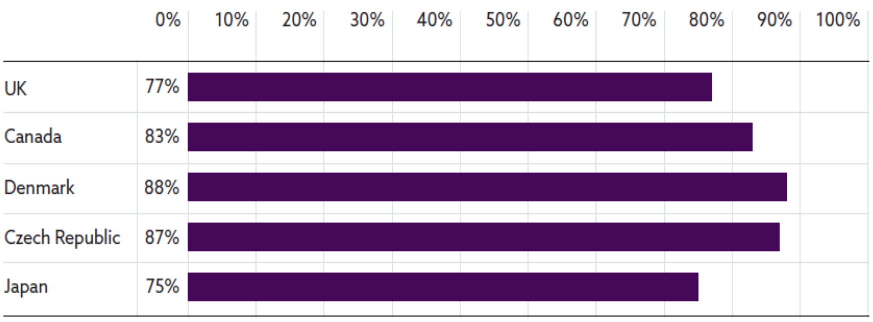
NATIONAL BIM REPORT 2016

The report we are waiting to explain to us the spread of Bim worldwide and from the first look we see the spread of knowledge and belief that it is the future, especially in the following:

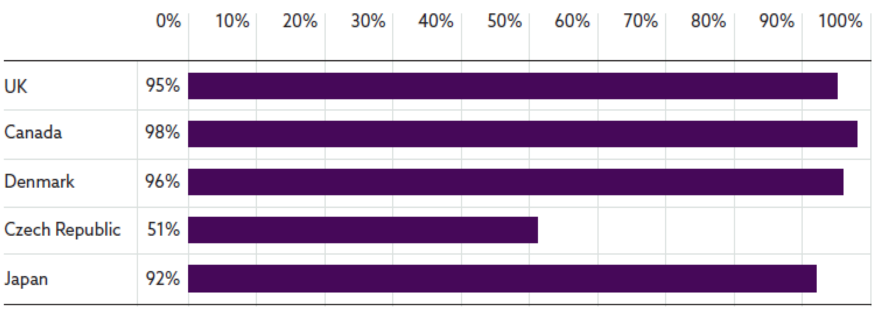


United Kingdom	77%	Denmark	88%	Japan	75%
Czech Republic	87%	Canada	83%		

BIM is the future of project information

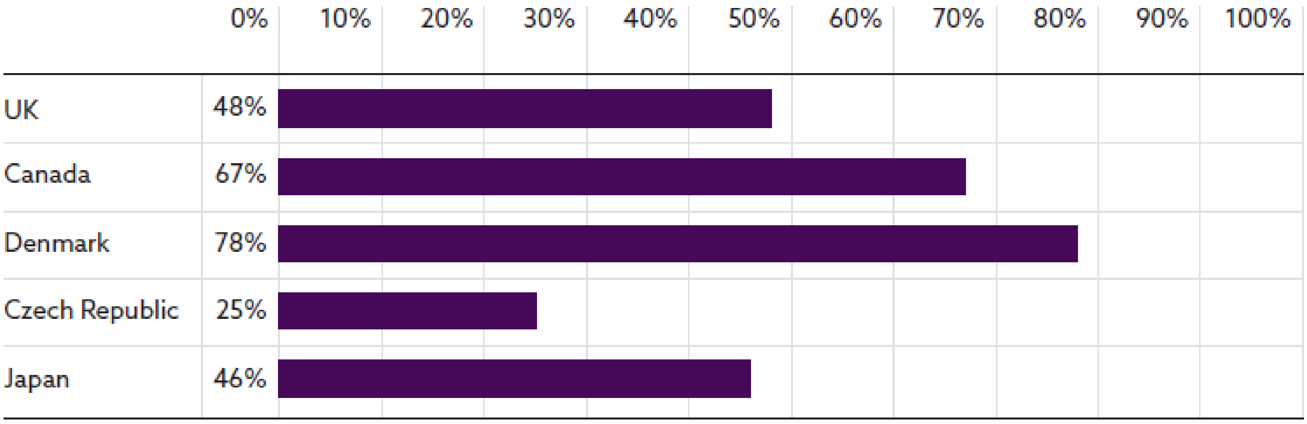


Awareness

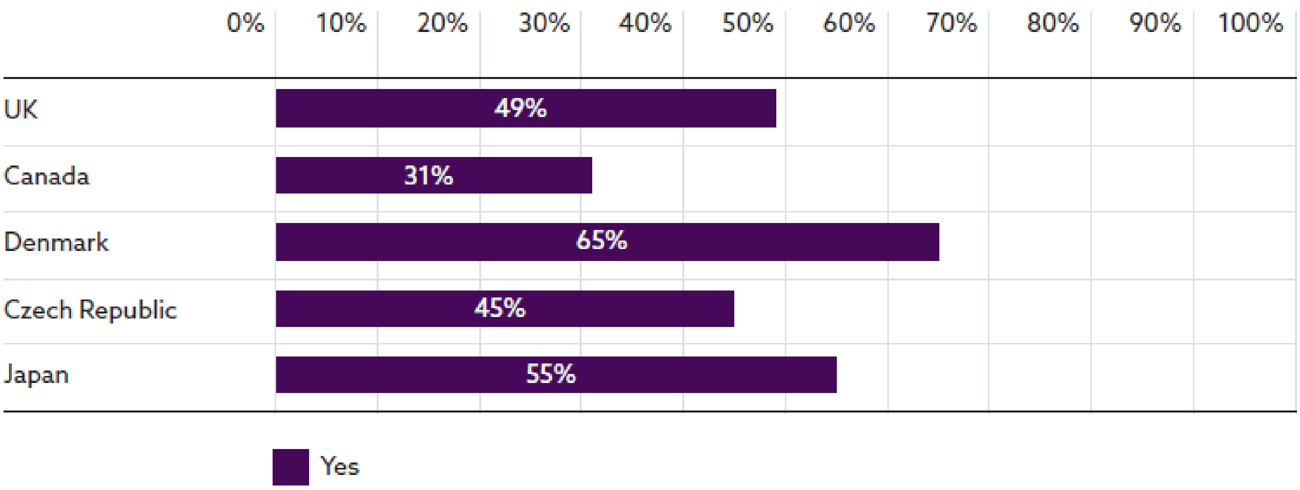


> *BIM technology can save a lot of serious and clear mistakes that we can face through construction without noticing them during the design phase.*

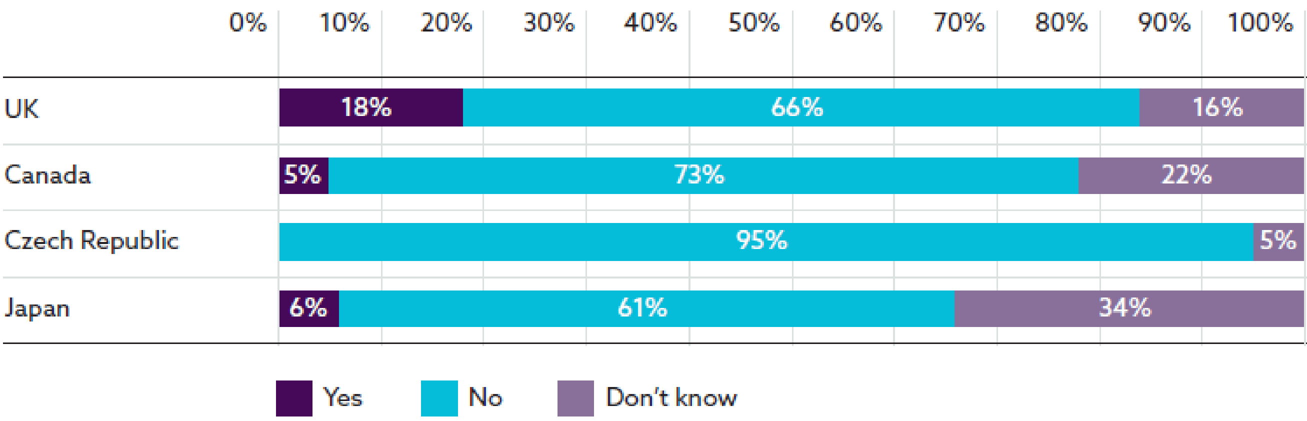
Respondents aware of and currently using BIM

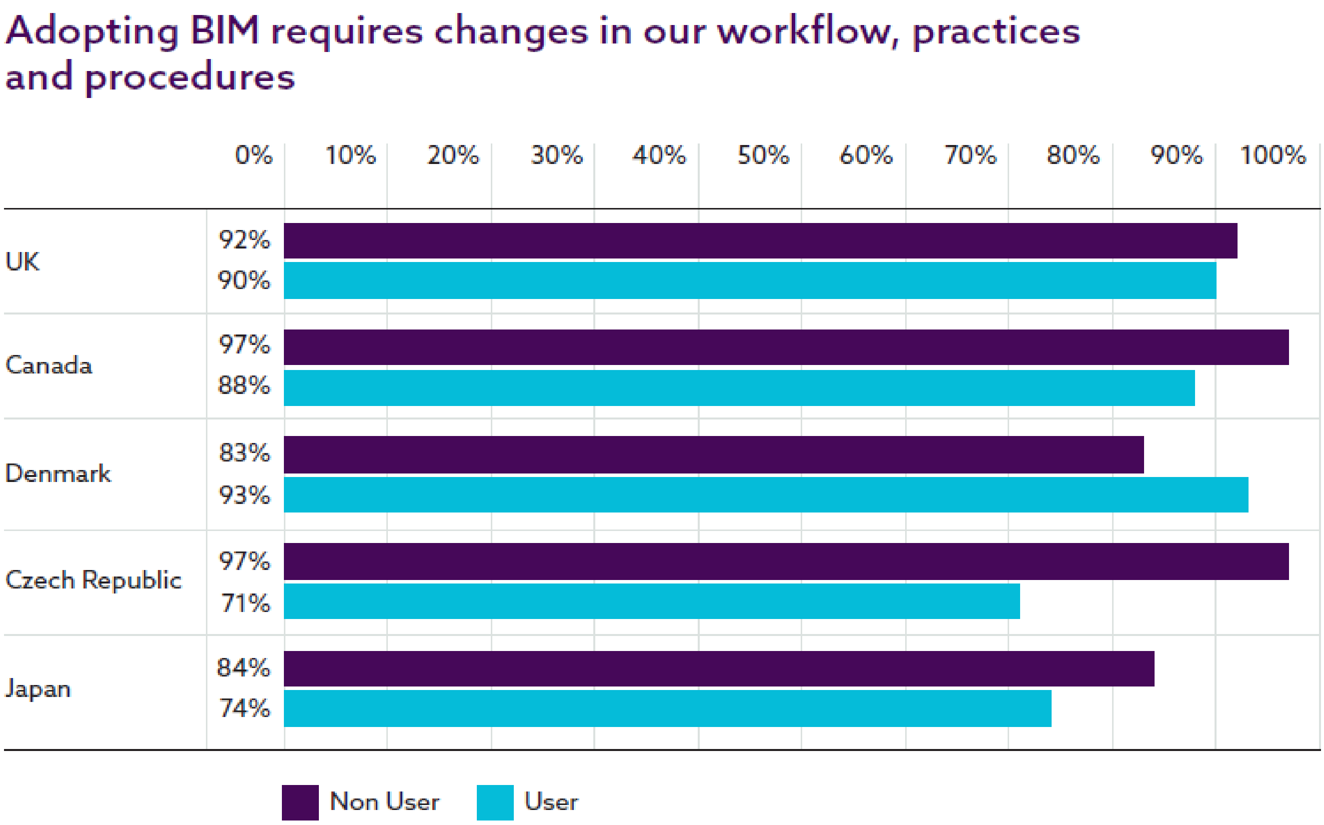


Do you use IFC on projects you've been involved with?



Do you generate COBie output for projects you've been involved with?





Conclusion

BIM is rapidly spreading to market needs and there is real awareness of it. We hope BIM Arabia will play a role in this and the most important obstacles to publishing BIM:

- Lack of knowledge about BIM companies.
- Cost of implementation.
- Lack of cooperation around BIM.
- Low customer request

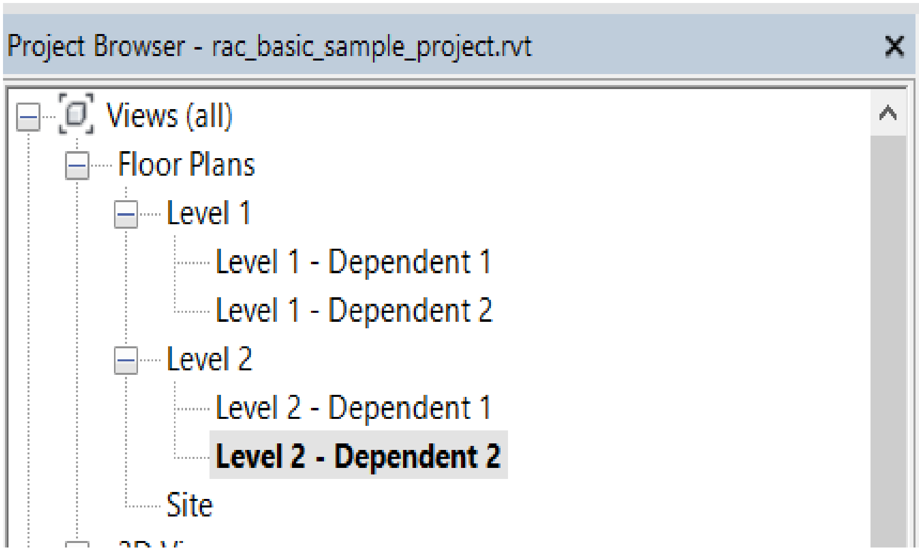
How to Change View Names by DYNAMO

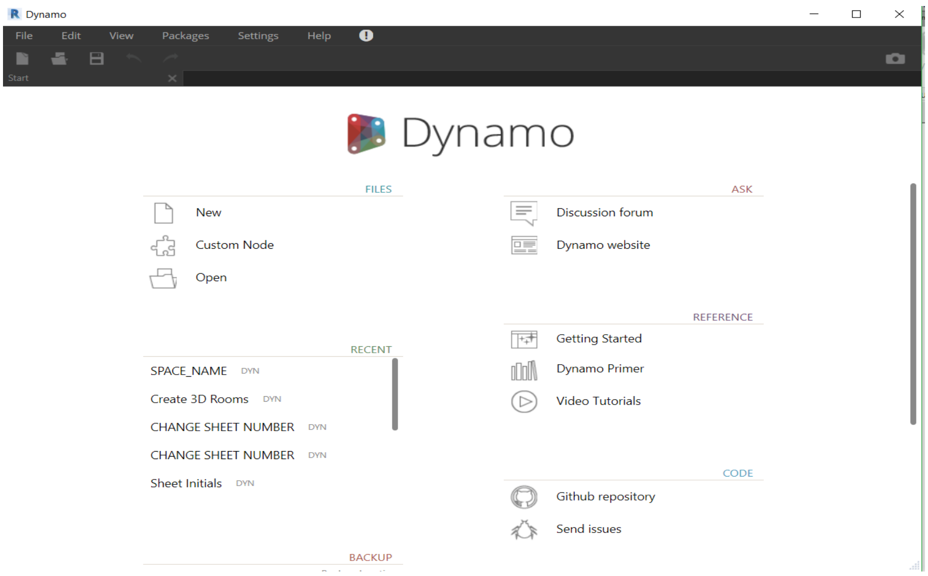


OMAR SELIM

Dynamo is an easy programming language which through you can program Revit, model difficult or parametric shapes, and repeat commands automatically.

In Revit 2017 release, Dynamo is implemented in manage tap, while before that release it was a separate extension,
For example, here we need to change view names from "Dependent #" to "Part #".



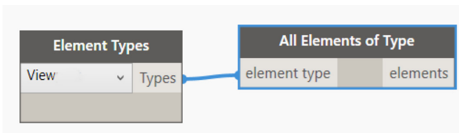


1- Open Dynamo.
2- Choose: Create a new file.

3-Select: Element Type, to select which type of elements need to be modified.

4- Select: All elements of type, to select all elements need to be modified.

5-Link two commands by pull exit from "Element Type" to the entrance of "All elements of type".



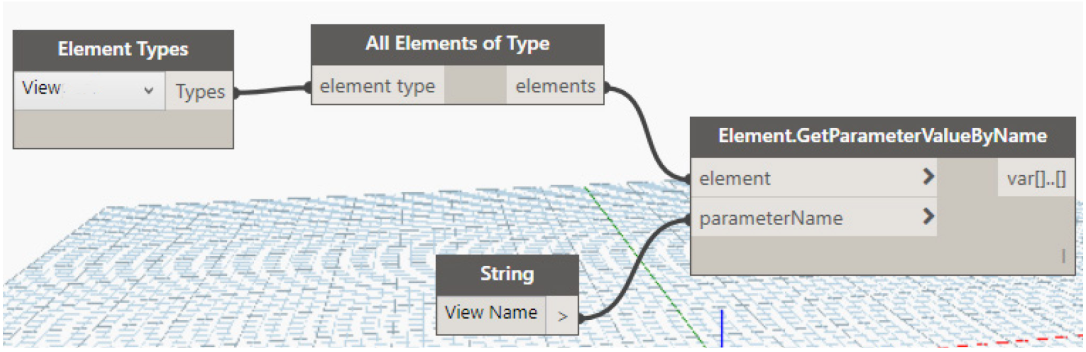
6-Add variable "Element. GetParameterValueByName".

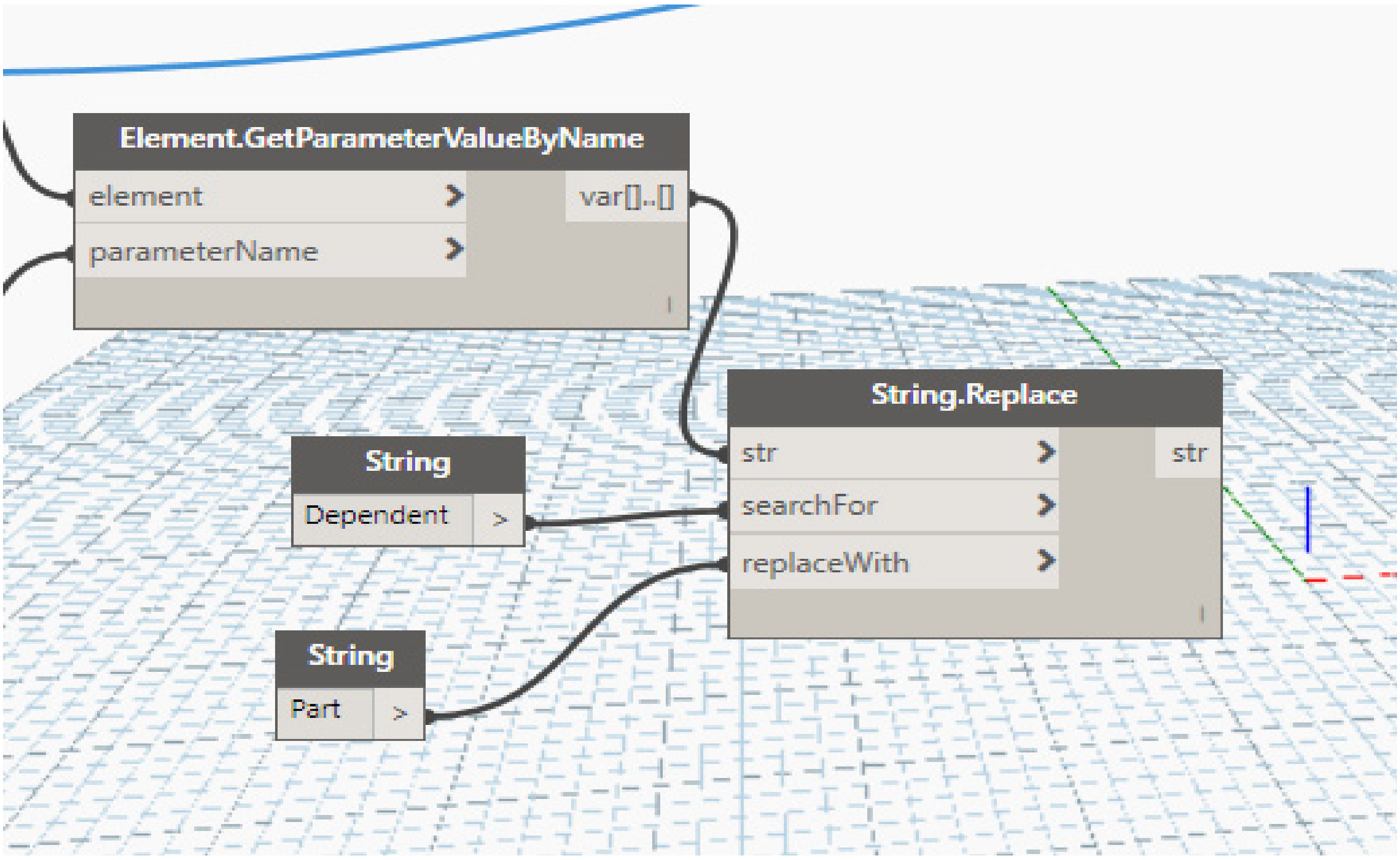
7- Add string and type "view name" as a parameter.

8-Add "String.Replace" to replace a ord by another.

9-Add string searchFor "Dependent".

10-Add string replaceWith "Part".

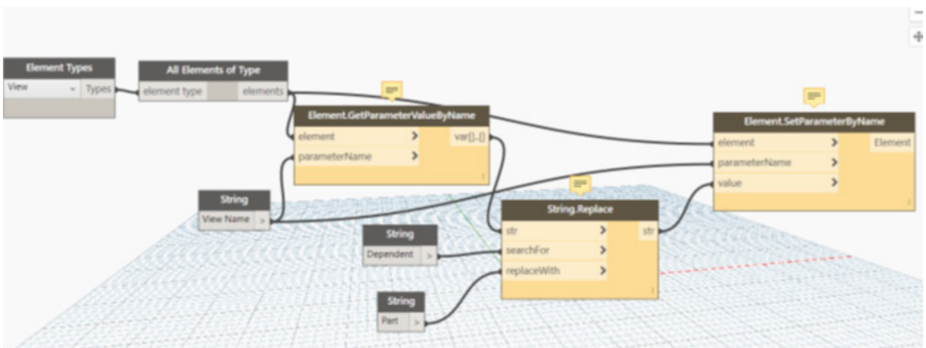


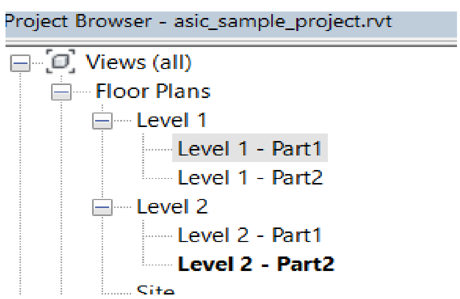


11- Add "Element. SetParameterByName" to define the parameter value.

12- Define element, parameterName, and value.

13- Click "Run" then the view names will change.





More References

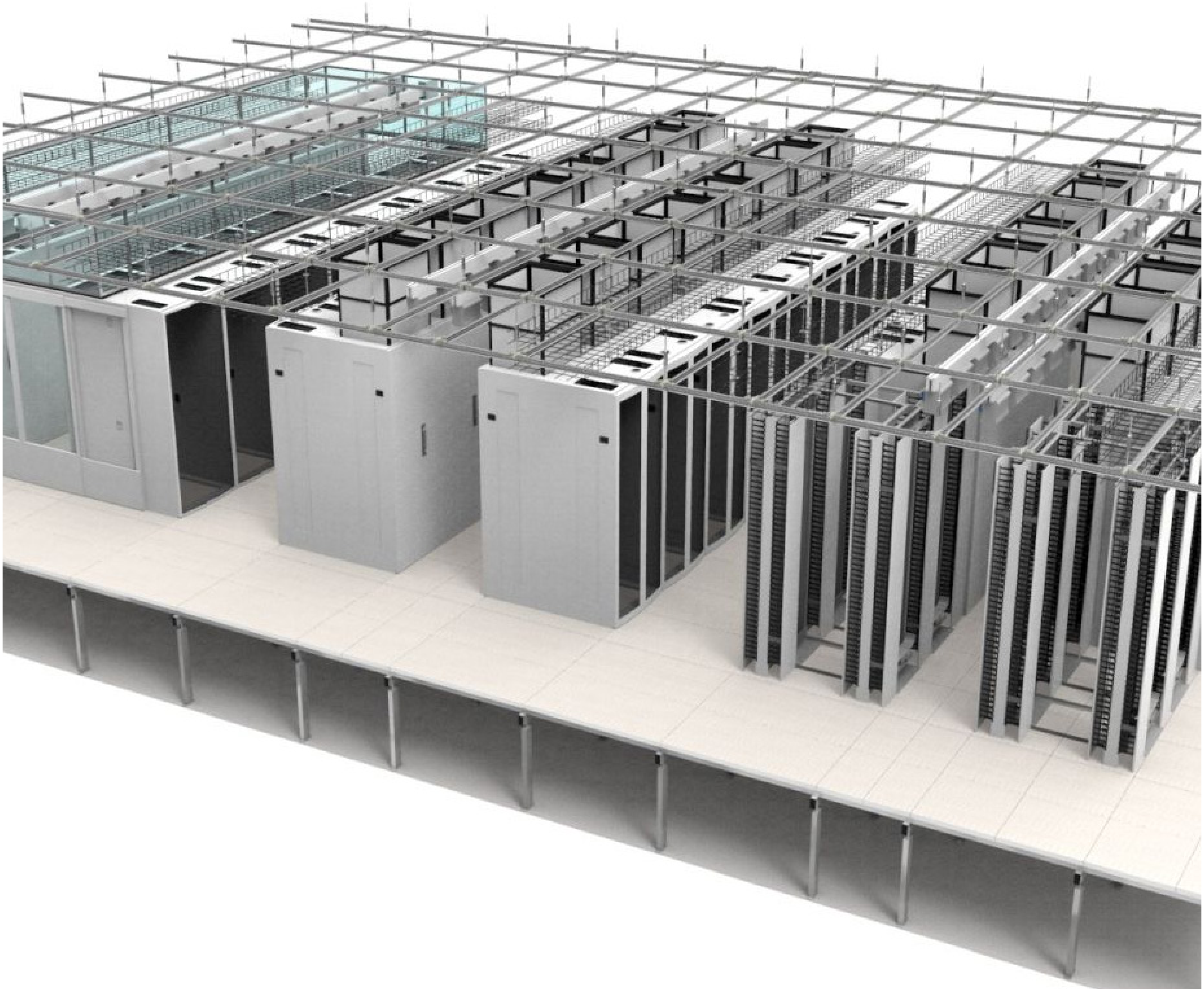
https://www.youtube.com/user/ENGWEB13

Coordinating False Works by REVIT

Part 01



ABDELHAKIM TALAAT



The coordination between the team members to produce a uniform and satisfactory ceiling for all needs to have a disciplined sequence in the completion of the work between the engineers and a special method in dealing with the orders of the program is different with the nature of the stage in which the project and also varies depending on whether the entire work is done in the program of or whether there is reliance on previous plans that were completed in the AutoCAD program. In any case, let us take up the subject as the work will start from the stage of the initial design without relying on any previous plans to the so-called executive plans, so we will divide this period into several stages as follows:

- Conceptual Design/ Schematic Design
- Design Development
- Final design stage

Phase I: Primary Design

Where the architect is often unique in carrying out the work in the program without interference from the rest of the parties except for oral consultations and some correspondence with other departments to ensure good coordination from the beginning.

At this stage, the architect has to design the falling ceiling of some spaces such as the lobby, main roads and some other places that require a distinctive interior design. And because the most important factors for the success of any project is cooperation from the outset between all parties, it is desirable to coordinate between the Department of Architecture and the Department of Electromechanics in several things before starting to create the model and these things:

The architect chooses at this stage the lightings shapes, air conditioning entrances and exits as required. It will be sufficient that these elements appear at the level of LOD 100 until the last stage of design process, while the electromechanical engineer needs to have these elements in his model at a higher level up to LOD 300 to final design. Therefore, one of the two good ideas:

A -The architect constructs these elements so that they look 2D in Coarse mode while they are three-dimensional in Fine mode, in which case he or she should exchange these elements with the Electromechanical Engineer to add the connectors and any other details in Fine mode to the LOD level 300.

B -or to make the elements used in the architectural model 2D only 2D, while the engineer of the electromechanical elements of 3D similar to the details of the details needed, in this case we use the Mapping feature when the transition between these elements between the architectural model and construction when the use of Patch Copy.

Determining how to create items If they are related to the ceiling based or surface based, the first type can be used without embarrassment if the architect starts using the elements in his model and automatically switches to face-based when they move to the special model. Using it, it must be in the face-based state so that it can be placed at the level of the architectural ceiling that is often drawn as a link file.

Phase II: Design Development

With the beginning of this stage, the architect has completely finished the addition of the ceiling falling in the architectural model, whether it has some elements of electromechanics as we mentioned from the lights and exits of the air conditioning, for example leaving the distribution of the rest of the elements of the section of electromechanical or that the architectural ceiling is completely empty without any elements.

> *"So the architect should create "Views" dedicated to the sections of electromechanics to standardize the display between everyone.*

At this stage, one of the electromechanical sections of the MEP Fixtures are being introduced into the architectural roof, but before the start of this step, the agreement improves on several things to facilitate the completion of the work between the departments without a stumble. So the architect should create "Views" dedicated to the sections of electromechanics to standardize the display between everyone and ensure that no errors in printing later, where the architect of electromechanical architectural ceiling in his file through the property (By Linked View).

For example, the electric engineer begins distributing light after the architectural file is withdrawn. The air conditioning engineer then distributes the elements on the ceiling after the two files are pulled out. The engineers will coordinate with each other in any conflict and then the fire fighting engineer distributed sprinklers after the withdrawal of architect, electric and air conditioning engineers. After coordination, the electric engineer distributed speakers, cameras and any other elements. After the withdrawal of architectural files, electricity, air conditioning and fire fighting will be coordinated by them and so on.

If the electromechanical engineer will connect the height of its elements (MEP Fixtures) to the architectural roof when distributed inside the file, it is necessary not to do so after the completion of the architectural ceiling and warning the architect not to delete any roof and draw again, but absolutely necessary, but only modify (Edit Boundary) so that it keeps the same ID and does not cause the transformation of the electromechanical elements to Orphaned. Its link to the architectural ceiling is lost and moved with it up and down when the height changes by the architect. If the figure of any element changes, During uncle re-host and if large numbers were can perform this process through an external socket Add-in re-link the re-host to a group of elements of the ceiling again in one step.

It may also be appropriate if there is no significant variation in the height of the one-storey architectural ceiling that the electro-mechanical engineer connects its elements to another level of Reference Plane but is at the same level as the architectural ceiling.



NAGWA SALAMA

Community of WOMEN in BIM

Recognising & Supporting Women in BIM

A number of websites and social pages of engineers working in the field of BIM have emerged to stimulate themselves and enhance skills

Our Mission:

To create a global online community of female Feminists (Building Information Modeling).

We invite the engineers to communicate with them to sharpen their inspiration, guide each other and present the best models of the best engineers in the field of BIM.

For example

http://womeninbim.net

https://twitter.com/WomeninBIM

Women in BIM database global group on LinkedIn



YASER ABOUELSAUD

BIM ENVIRONMENTAL IMPACT



Episode 01 THERMAL MASS

This is the first topic from a series of topics in the term of using practical BIM application in the design of environmentally friendly buildings. This is an attempt to clarify the ability to understand academic knowledge and translated into several easy steps can be used by the designer to perform more realistic model in terms of architectural outputs.

This work has been used to improve BIM ability to exceed the fifth dimensions to reach the sixth to assist the designers to perform a wide range of analysis in an earlier stage, which will help to take very accurate decisions in the right time. In this series several terms related to environmental elements will be investigated, these elements have a considerable impact on our daily life which may be very difficult to be spotted by the design team.

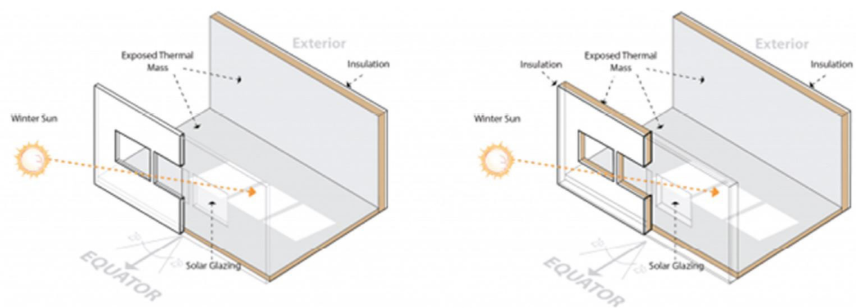
These new terms will be explained in a very simplified way and examine its advantages and disadvantages by using BIM application.

1- THERMAL MASS

Thermal mass can be defined by the ability of the material to resist the change due to the thermal changes. The increase in this ability will increase the material capability to store and observe temperature.

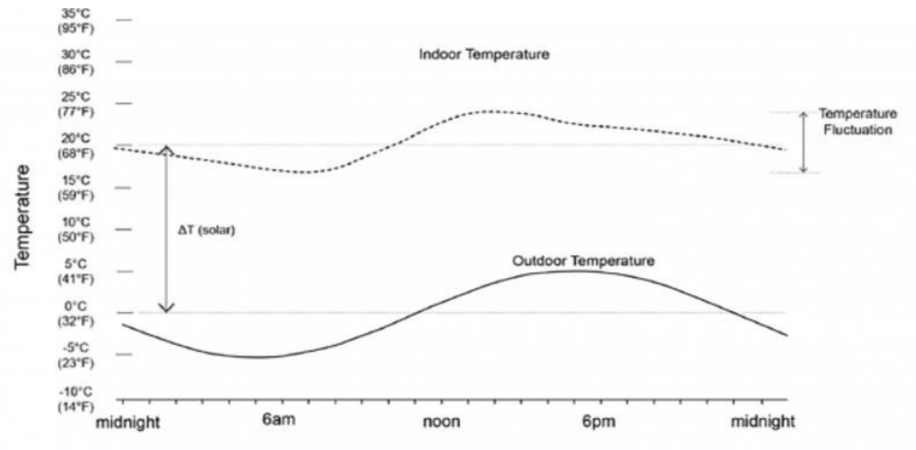
Thermal Mass used as an effective tool to design natural thermal warming system by using solar energy, which can produce the ability to store the energy that has been observed from the sun and retrieved with time. In contrast, can protect the material from accelerated heating due to sun exposure.

> *"Thermal Mass used as an effective tool to design natural thermal warming system by using solar energy*



1- Direct gain passive heating system

The direct gain heating system can be developed via a passive heating system with system elements, which contain the followings:
1-Sun Glazing (Collect solar energy)
2-Thermal Mass (Store solar energy)
3-The distribution of the windows can affect the system efficiencies.
The ability to use thermal mass in building design.



The buildings that have been heated via direct solar energy, which has been entered via different ways such as glass windows and roof openings. These ways can be figured out during the design stage and make a thermal calculation to determine average temperature ΔT. This term can be estimated as the difference between the building inside and outside temperature. The majority of this energy will be stored in wall, floors, and roofs and will be released during night time. The amount of this energy, location, and the area can affect thermal mass creation and temperature fluctuation inside the building for 24 hours.

During the winter season, the building can lose around 65% of its stored energy during night time and 35% only during day time. If the areas of glass allow storing enough solar energy during clear days in winter, this energy can be used to heat the entire building for 24 hours. While, if there is limited stored energy during day time will be not enough to keep the building warm during night time, this process called High-Temperature Fluctuation.

The elements that affect the usability of thermal mass

A-Location, thickness, and distribution of thermal mass

The relationship between the glass area, which allow the solar energy to enter the building and the area of the roof with the thickness of the thermal mass can affect the temperature fluctuation. While the building material can transfer the heat slowly from roof to wall material, this requires enough area from the thermal mass in the space and it should be distributed among large area. This can control temperature fluctuation among acceptable limits.

- It is desired to construct the internal building with a thickness of not more than 10 cm (wall, roof and\or floor)
- The percentage between the roof area and glass area at least (1:3). The desired percentage (1:9).

The increase in the percentage of Mass/ Glazing area ratio will increase the stability of internal temperature. The fluctuation of temp inside the space during the day can be explained as the differential areas of thermal mass to glass area which can be calculated by using the below table:

The ideal situation for (Direct gain: Glazing) ratio to calculate the area of glass that is exposed to the sun is the average temperature during the winter clear day must equal to 70F or 21C. Otherwise, the ΔT can be calculated by the difference between 70F or 21C and the average external daily temperature during the winter season (the coldest months).

Mass / Glazing Area Ratio of 3:1

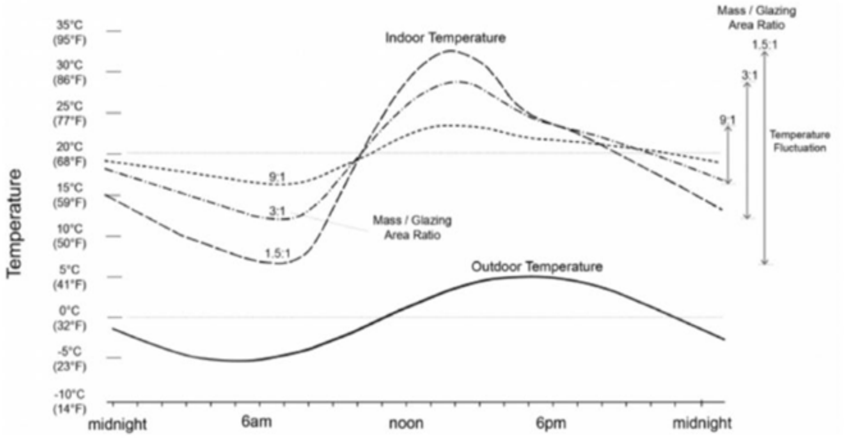
For 4” (10cm), 8” (20cm), 16” (40cm) of exposed thermal mass thick

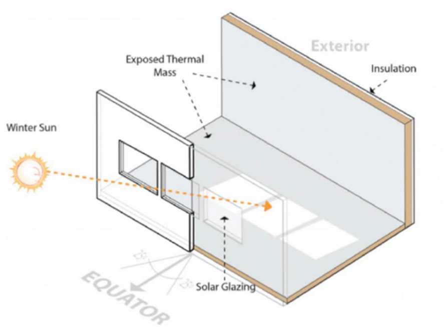
The surface area of concrete exposed to over the day is 3 times the area of the solar glazing. The illustrations represent a space with glazed openings and light-colored interior surfaces and a medium colored thermal mass floor or wall.

> *The increase in the percentage of Mass/ Glazing area ratio will increase the stability of internal temperature.*

Mass/Glazing area ratio	Formula of Indoor Temperature Fluctuation
1.5 : 1	1.11 x *ΔT (Solar)*
3 : 1	0.74 x *ΔT (Solar)*
9 : 1	0.37 x *ΔT (Solar)*

Mass/Glazing Area Ratio Temperature Fluctuation



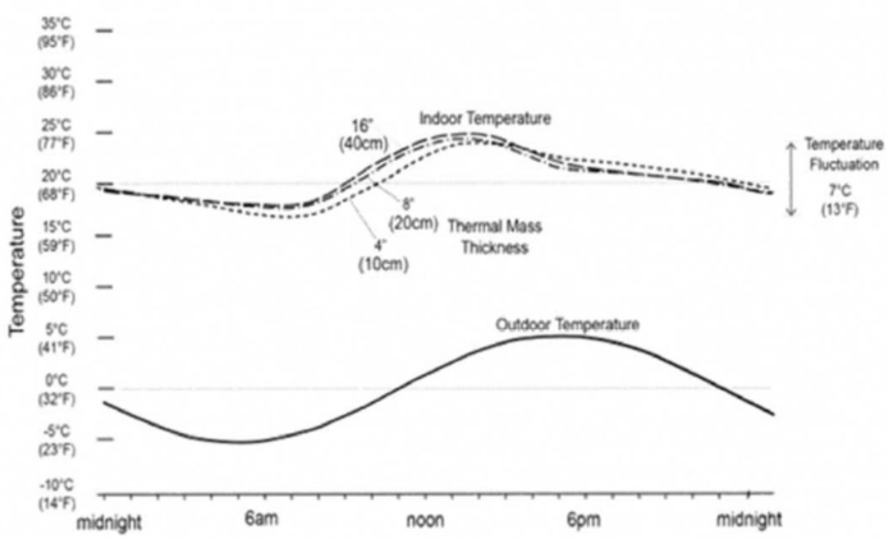


The graph illustrates space air temperatures for a glazing area to thermal mass surface area ratio of 3: 1 and mass thicknesses of
10, 20 and 40 centimeters (4, 8 and 16 inches). An increase in masonry thickness beyond 20 centimeters (8 inches) results in little change in space temperature fluctuation. The temperature fluctuation over the day IS
approximately l4°C (26°F).

Projects benefited from thermal mass analysis

Thermal mass masonry floors, walls and/or ceilings absorb and store daytime solar heat in winter for release at night.
A large portion of the sunlight (heat gain} admitted into a space during the daytime must be stored inside the same space for release during the nighttime hours.

To store a portion of the heat gained, construct walls, floors and/or ceilings of masonry (concrete, brick, concrete block, adobe, etc.):
A minimum 10 em (4 inches) in thickness, with An exposed 'surface area to solar glazing area ratio' of 3:1 to 9:1.
The higher the ratio, the more heat stored and stable the indoor temperature becomes.
Make ceilings and lightweight construction a light color, walls any color, and floors a medium to dark color. For exterior masonry walls, locate insulation on the exterior side of the wall so the masonry is exposed to the interior.



REFERENCES

BOOKS

Passive Solar Heating Analysis: A Design Manual. J. Douglas Balcomb, et al

The Green Studio Handbook. Alison G. Kwok and Walter T. Grondzik

The Passive Solar Energy Book: A Complete Guide to Passive Solar Home, Greenhouse, and Building Design. Edward Mazria

Heating, Cooling, Lighting: Design Methods for Architects. Norbert Lechner

TOOLS

University of California, Los Angeles: Energy Design Tools

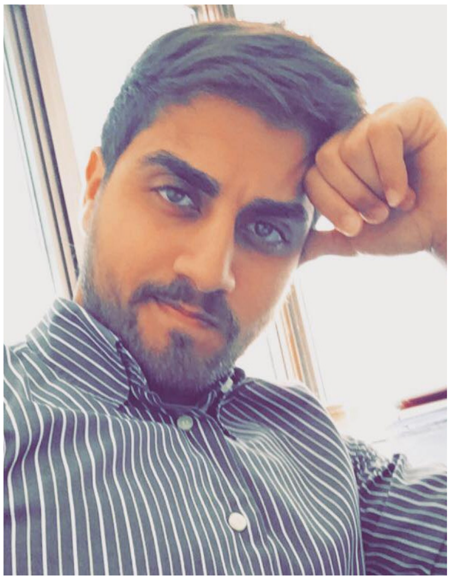
U.S. Department of Energy: Energy Plus

Integrated Environmental Solutions: VE

Autodesk: Ecotect Analysis

National Renewable Energy Laboratory: SUNREL Energy Simulation Software Sefaira

Report on BIM CONFERENCE in KUWAIT



RAMY MOSTAFA

The conference was attended by many local and international companies including design and contracting sectors as well as engineering students from the Australian College in Kuwait. "Some of the attendees clearly explained the meaning of BIM, and the risk associated with it and showed it to be a promising process for the engineering world as to how much productivity it can achieve. Others focused on advertising their products and made them look very easy even though they are still complicated to implement. "We were very surprised to learn that future projects in Kuwait are expected to be implemented through BIM," said Zainab Ali Farhat, a student at the Australian College in Kuwait. "The presentation was generally well presented as it gave us an idea of BIM. Graduated "

The main address of the conference was BIM. BIM was extensively discussed in the gallery during the breaks and at the multiple exhibition stands at the exhibition that accompanied the conference. The ceremony was opened by Eng. Ahmed Al-Manfouh, Director General of the Municipality of Kuwait, where he spoke about the importance and significance of the changes in the use of BIM in Kuwait. Simple things can be mentioned such as saving time, saving cost and providing quality. He also expressed his vision regarding the launching and implementation of Kuwait Municipality projects in the light of BIM. The words continued like Dr. Hussein Al-Shatti, Professor of Architecture, Rural Design and Rural Planning, Department of Architecture, Kuwait University, who presented the creative work done by KU students by creating sizes and pallets using BIM technology. Were transferred mainly from mass production to mass manufacturing that was currently used in the martyr project.

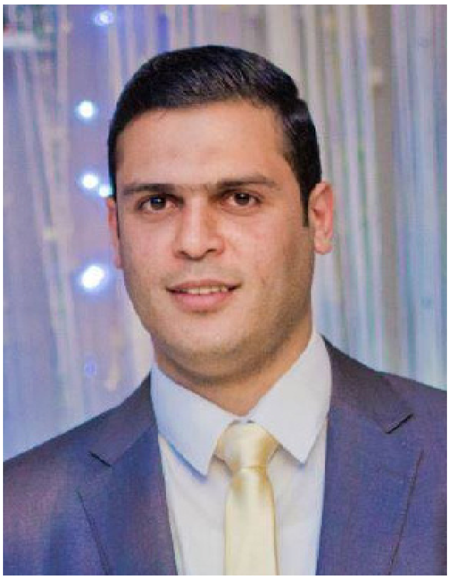
Engineer Ayman Al Moussawi, Director of Design and Construction Project Management, spoke to the Kuwaiti Ministry of Public Works, who also emphasized the importance of BIM during design and implementation. He added that they look forward to implementing the BIM strategy to achieve multiple objectives such as delivering a detailed and graduated BIM implementation plan, analyzing the delivery of the current project, specifications and documents related to BIM and the organization, and supporting the implementation of two pilot projects, including programs, tools and staff training. CPS and implementation of the BIM Awareness Program at the Ministry of Public Works. However, he noted several challenges, including: long bureaucratic procedure, lack of local expertise in BIM, resistance of the local AEC industry, resistance of other government agencies, technical problems and the result of creating obstacles and maintaining static information. Eng. Ayman pointed out that the Ministry of Public Works continues to implement its role by following and providing BIM to add value to the delivery method of the project.

The second day of the conference includes more exciting educational presentations. Projacs, Pimetek, Sever and Trimble used the entire day to draw the audience's attention to their ability to use BIM in real-world implementation.

Engineer Salah Omar Omran, BIM Director, PhD student, Master of Science, BIM accredited director, Autodesk Tutor certified his thesis in a case study on the introduction of dimensions in the design structure using Revit from Autodesk. Dimensions include a three-dimensional model and time and environmental aspects. He was also able to devise an automated system that creates materials and designs components that meet standard requirements based on the client's required aspects.

Mr. Sabri Kishman took the opportunity to promote the use of Trimble solutions in construction and design. Trimble wanted to deploy its service through the use of Tekla, which it considered more accurate than the Revit. Ramzi Qamar, Managing Director of BIMTEC, emphasized the high power of Tecla through the construction department. He provided examples of positions that determine the location of the packing (preparation of the construction site), which were designed and simulated and avoid catastrophic damage by colliding and collapsing tower crane.

At the end of the conference, he presented a clear vision of the importance of implementing projects through BIM. The nation has reached the stage of mechanization of construction and design through smart technology. Who knows in the future when robotics and 3D printers are used, where will the construction industry arrive. Will we see a robot dealing with all construction work instead of workers? At the same time, how the replacement of the workforce by programs and robots will affect the state of work in our region.



BIM is one of the reasons for Commercial Bankruptcy !!

KAMAL SHAWKY

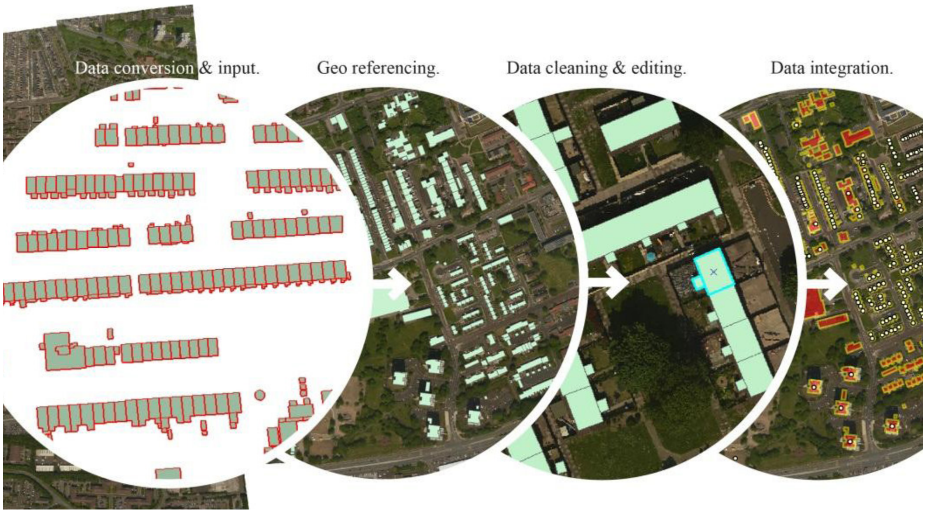
After nearly seven years of work in the field of BIM, and training for several major companies in the field of engineering and the general trend in the construction sector to BIM technology, it is possible that this technology and adaptation to it are one of the main reasons for bankruptcy or loss but how ??? ... This is what we will learn in our article

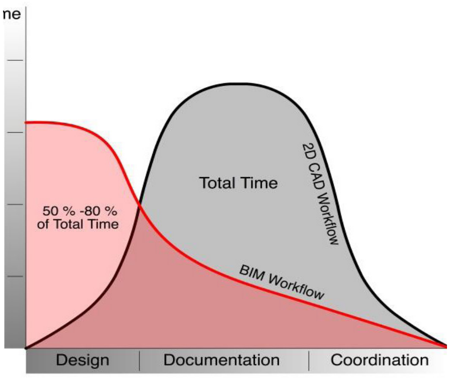
During the rise of this technology, several studies appeared which have confirmed its importance and its need in the labor market, for its diverse advantages, and perhaps the use of this technology is more important than the transformation occurred between manual drawings to AutoCAD. Let us now review our article.

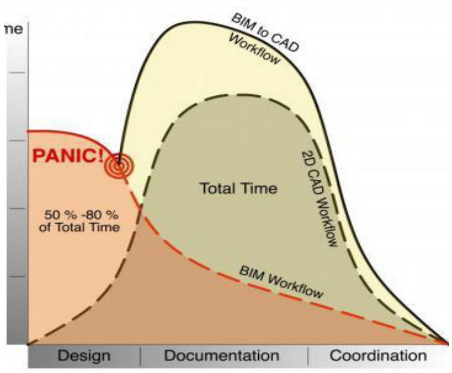
Working in AutoCad environment and BIM environment

In this chart, we can find a simplified explanation of the difference in time and effort between the two environments during various project phases. Red color represents the work in BIM environment and the black color represents the work in AutoCAD environment. As noted, working in BIM environment takes longer during the project design phase, opposite to working in AutoCAD environment which takes less time, but if we move to the other stages of the project we will find work on the BIM environment has already provided more time and effort than the AutoCAD, and this is the longest period in the project stages.

Overall, working on BIM environment is much better than the AutoCAD environment, especially the stage of the shop drawings and coordination between different departments, and this stage is the most important stages of the project, which depends mainly on the time of project implementation and loss.



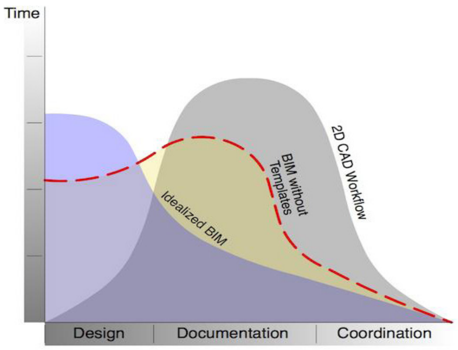




Panic Point

With the rise of technology and the beginning of its use, especially with the major engineering companies, some companies have started to work with this technology and others are looking forward to what will result in the conversion between AutoCAD and this technology, especially as this transformation will cause the companies to pay money on training and devices. Hence, the companies, after learning about the importance of this technology, started immediately to prepare for this experiment and transfer to this technology. They start to bring engineers who are familiar with a program such as "Revit" to work for projects that use this technology. There is a wrong belief among the engineers that Revit is BIM.

Some companies have already started projects to use BIM or Revit in the project. As the companies did not follow the best method of converting from AutoCAD to BIM and preparation for this change, problems began to be encountered while working on the project.
From here, many engineers began to switch from Revit to AutoCAD for easy completion of the project. As a result, bigger problems rose and it took longer time in design than the traditional method especially the time and effort wasted in the conversion from Revit to AutoCAD and go back to work in AutoCAD program.



Working with BIM environment

Some companies have begun to work on projects using Revit or BIM technology without adequate preparation for conversion, resulting in wasted time and effort than time spent in the traditional way.

Other companies did not follow the same method, but began to prepare themselves for conversion by training engineers, making sure of the existence of devices that have the capability to match with the programs that will be used, and studying the good new programs by understanding how to work with all disciplines. From here, benefits of conversion to BIM in time and effort compared to the traditional way began to be gained.

Best use of BIM technology

As mentioned previously, some companies started to transfer without preparation and got consequences for this impulsiveness, and some prepared well and reap the benefits of conversion and its benefits - others are the least part prepared well by training and ensuring the existence of devices that match with new programs and creating "template" for the company before starting in any project. As a result, greater experiences gained are much better than all other companies.

Simple example to illustrate the difference between the companies mentioned is:

Assume that the project using traditional method takes time which is represented by X:

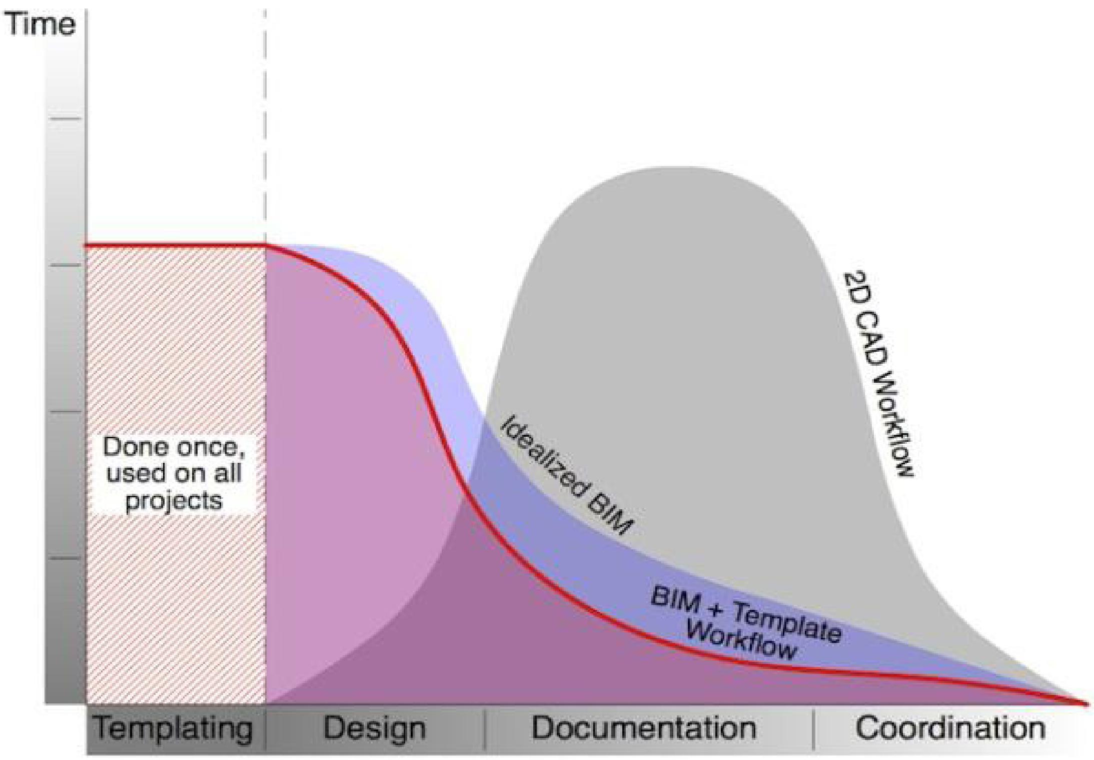
Using BIM without preparing it and switching to the Autocad in the middle will take 1.5 X

Use BIM and prepare it without using a "template" will take 0.7 X

Use BIM and prepare it with a "template" will take 0.5X

Finally, I would like to give advice to each office or company seeking to transfer to BIM. It should have good preparation, enough training and the use of experienced people in the beginning of the projects to transfer their expertise to the rest of the team. A lack of good preparation for conversion may cost the company a significant loss that could lead to bankruptcy.

> *"Some companies have begun to work on projects using Revit or BIM technology without adequate preparation for conversion, resulting in wasted time and effort.*





How To MARKET a project in a Professional way using the Terrible Triple



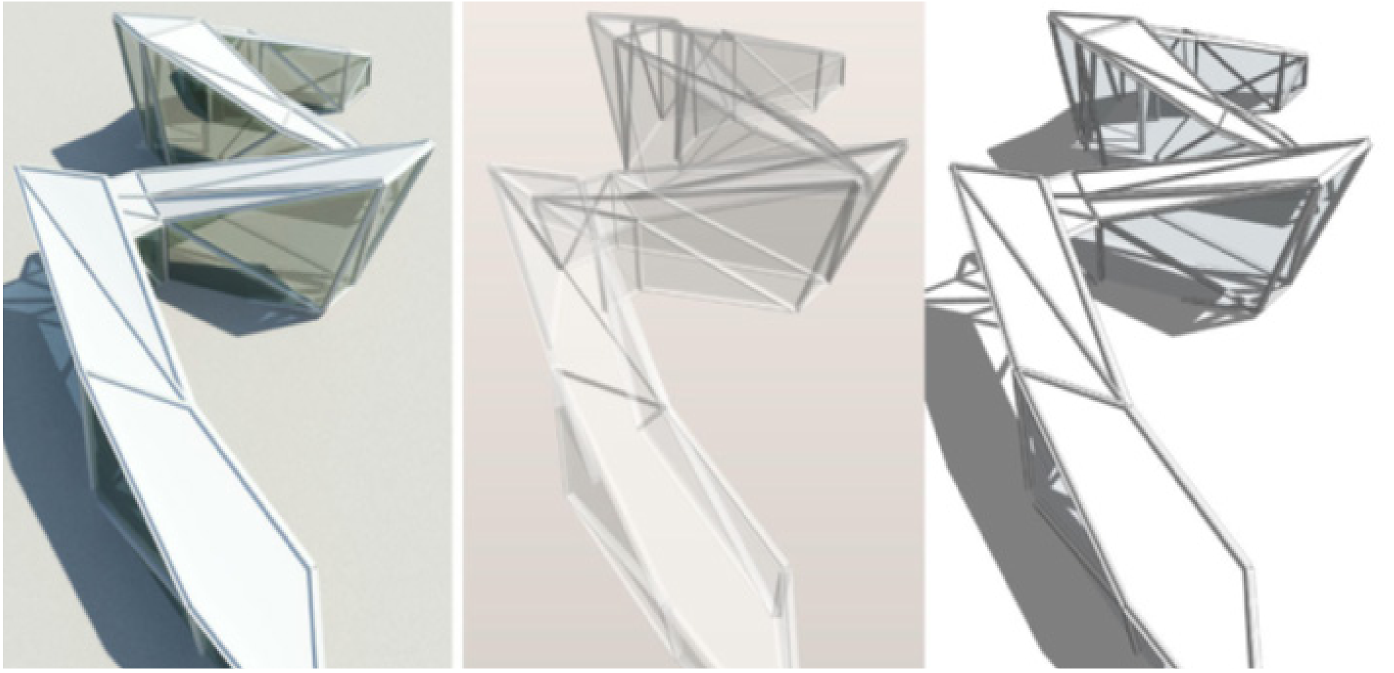
AMMAR ELTAWM

A year ago, I wrote an article entitled "Using BIM in gaming machines and virtual reality" where I discussed the maximum control techniques and guidance reached in the wide and exciting BIM world.

Today I will talk about something very important which is how to market your model to customers using that technology in a professional manner to win their satisfaction and approval and to have your special fingerprint in the architectural and real estate market.

(The Terrible Triple) is a small sentence that will only be understood by those who have actually tried this kind of work, so let us discover it. It is known that the model is built in one of the BIM applications such as Revit, ArchiCAD, or others and each have its advantages in the presentation to the client. So that he can understand his project such as changing the visibility settings quickly using shading or render settings.

New improvement begins to appear either in these options or in the form of services or mini-programs that help to reverse the content of the model better and more beautiful than before in what is known Revolution in the world of marketing models or Marketing Models, including:



First: Use Twin motion program which is specialized in animations, to create a kinetic model based on the connections of elements in BIM software, so the owner will be able to visualize construction processes and build the project before it is executed.

You can actually try to apply this to your devices through the following link and download files Located in it and run it directly without the actual need of the program:
https://twinmotion.abvent.com/en/bimmotion

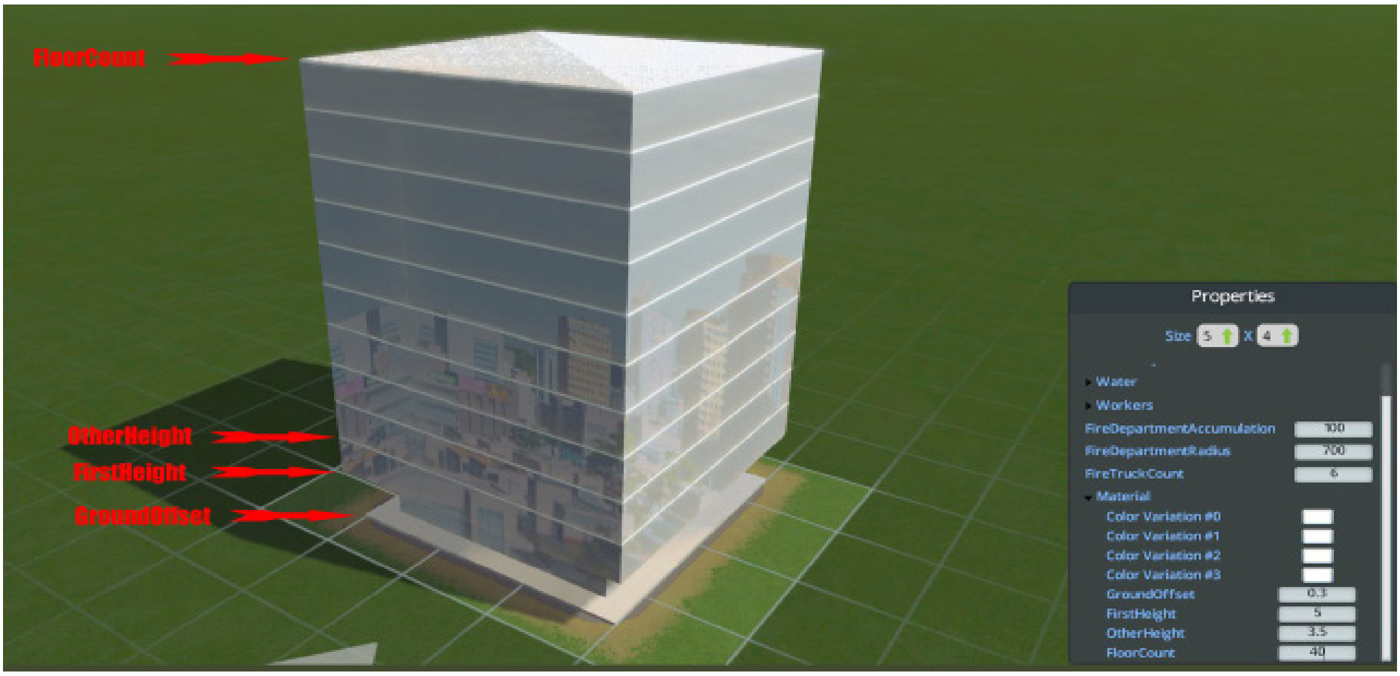
The options in the program allow you to control the construction stages and also control the visibility and cameras. Which is considered as a revolution in the world of modeling models of the world of BIM.This program also provides a complete virtual simulation environment around the site as well as the traffic of cars and pedestrians as well as shadow control by months.The interesting thing is that when you choose the night time format in the project you will notice the cars and poles lighting changes automatically.

Second: Use Cities Skylines to see your models in a full city environment. Where you are the one who designs it as well as the laws and legislation that govern them such as taxes, and the demographic distribution of the population, and the distribution of areas to residential, industrial and commercial, and also control the exports and imports through the movement of air and seaports in addition to the control of electricity and water is.

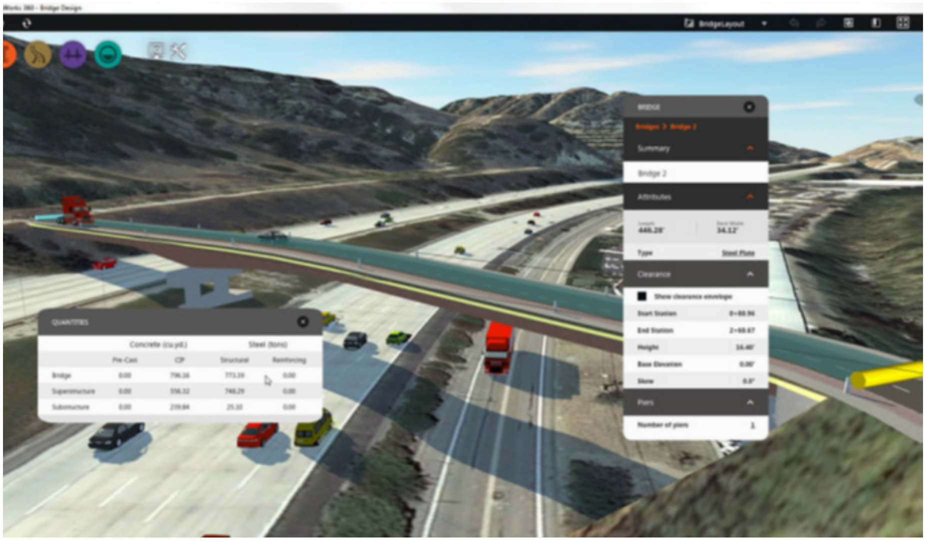
Remember that you can enact a smoke-free law. This simulator actually gives you a fun experience to see your models which designed and built in front of you and see all the life forms around it in an extraordinary experience in this world is interesting.

This program accepts files of type (FBX) and (OBJ) in the export operations of programs and you can easily add material in BIM programs.





Third: Autodesk Infraworks 360 program is a revolutionary program in the Infra Structure world, which gives you a complete control over the design of streets, bridges, intersections, and rotations and saves you an integrated design environment to build your road model including all elements of the middle islands and even road shoulders as well as footpaths, wheels and car service tracks.



Above all, it also designs all the utility services such as power and sewage lines in a three-dimensions so that the right stakeholder can see all this easily.



There are always people working day and night to provide and create patterns and programs through which we can preview our models and present it to the owners in the same format, so we can deliver the information to them in the required form, in addition to an interesting marketing process for both sides and in the interest of all. In the next issue, I will deal with each of these three simulations in detail.

In order to make more use of them now, we know who are the terrible triple and we know what world they are talking about.

About our world,

BIM world.



YASER ABOUELSAUD

Building Energy MODELING (BEM) TOOLS

The past decade has seen remarkable growth in the Building Energy Modeling industry, primarily driven by more stringent building energy efficiency standards and growth in voluntary building energy certification programs such as LEED. Following are descriptions of the most widely used Building Energy Modeling (BEM) tools in the United States, both calculation engines and interfaces, at the time of writing of this guide. While extensive, this list makes no claim to being comprehensive.

Please note that these tools are currently and typically used later in the design process, once engineering system selection has occurred, and for code or third-party rating/certification compliance. The energy modeling simulation and program development industry is gaining widespread adoption at an increasingly rapid rate; thus, new whole building modeling tools, as well as associated Design Performance Modeling, tools are being developed and released regularly. It may be worth noting that the holy grail of energy modeling software has yet to be found.

Architects and software developers are still on this quest, and all tools have pros and cons. What is important is to pick one that seems appropriate for your practice and that you are comfortable with and to simply start using it. Table 1 shows the energy simulation tools developers.

Table 1. Energy Simulation Tools Developers (AIA 2012)

Engine	Interface	Publicly & funded	Free
DOE-2	eQUEST	yes	yes
	Visual DOE	yes	yes
	EnergyPro		
	Autodesk GBS		
EnergyPlus	Bentley Hevacomp		
	Design-Builder		
	OpenStudio	yes	yes
	Simergy	yes	yes
Energy 10		yes	yes
TRNSYS	TRNSYS	yes	yes
HAP	HAP		
IES-VE	IES-VE		
TRACE 700	0 TRACE 700		

Modeling Tool	Calculation	Graphics interface	Graphics results	Appropriate for	Approved for	Freeware
COMFEN (RESFEN – residential)	Engine	for front-end input	provided	early design	code compliance	yes
DesignBuilder	EnergyPlus	yes	yes	phase	modeling	No
Ecotect	EnergyPlus	yes	Limited	yes	No	No
EMIT1.2	CIBSE Admittance Method	yes	yes	yes	yes	yes
Energypro	None	No	Not specifically,	yes	No	No
eQUEST®	(spread-sheet)	No	but s/s capability	yes	No	yes
green building studio/ Vasari	DOE-2.1E	yes	No (auto generates compliance report)	No	Yes	No
hourly Analysis program (HAP)	DOE-2.2	yes	No	Must be far enough along to input HVAC	(easiest to use)	No
	DOE-2.2		yes	yes	yes	No
IES Virtual Environment	Transfer Function Method	Limited			(most popular)	yes
OpenStudio	Apache	yes	No	No	No	No
Sefaira concept	EnergyPlus	yes (similar to SketchUp)	yes	Gaia +Toolkit yes		yes
Simergy	Sefaira	yes	yes	Pro requires the input of HVAC	yes	No
TAS	EnergyPlus	yes	yes	Must be far enough along to input HVAC	yes	No
TRACE® 700	TAS	yes	Limited	yes	yes	No
TRNSYS	TRACE	No	yes	Not yet	No	
	TRNSyS	yes	Limited	yes	yes	
			No	Must be far enough along to input HVAC	yes	

Table 2: Currently Available Building Energy Modeling Software Tools (AIA 2012)

DOE-2 (ENGINE)

DOE-2 is a Building Energy Modeling program developed by Lawrence Berkeley National Laboratory, funded by the Department of Energy. It calculates energy performance and life-cycle costs of operation of whole-building projects. Two versions exist DOE-2.1E and DOE-2.2.

EnergyPro

EnergyPro is an interface for the DOE-2.1E engine that can be used to perform several different whole-building energy modeling calculations, most widely used for California code compliance: California Title 24 hourly energy analysis of low-rise residential buildings with an approved residential simulation (ResSim*); or California Title 24 energy analysis of nonresidential buildings, hotels/motels and high-rise residential buildings with either a prescriptive method approach (NR Prescriptive*), or a performance simulation method (Win/DOE*). Note: (title*) indicates the name of the specific package that should be used for the associated project type or compliance path (AIA 2012).

VisualDOE™

Is a Windows interface for the DOE-2.1E energy simulation engine, through which users can construct a model of the building's geometry using standard block shapes, a built-in drawing tool, or by importing DXF files. It is arguably friendlier and easier to use than eQUEST. Building systems are defined through a point-and-click interface. A library of constructions, fenestrations, systems, and operating schedules is included, from which the user can choose, although the user can add customized elements as well (AIA 2012).

Green Building Studio (GBS)

GBS links Autodesk architectural building information models (BIM) and certain 3D CAD building designs with energy, water, and carbon analysis, enabling architects to quickly receive feedback about the operational and energy implications of early design decisions. The Autodesk GBS web service automatically generates geometrically accurate, detailed input files for major energy simulation programs. GBS uses the DOE-2.2 simulation engine to calculate energy performance and also creates geometrically accurate input files for EnergyPlus (AIA 2012).

eQUEST®

Is probably the most widely used graphics interface for the DOE-2.2 calculation engine. Its wizards, dynamic defaults, interactive graphics, parametric analysis

and rapid execution make eQUEST able to conduct whole-building performance simulation analysis throughout the entire design process, from the earliest conceptual stages to the final stages of design (AIA 2012).

EnergyPlus (engine)

EnergyPlus is DOE's flagship Building Energy Modeling tool. Replacing the DOE-2 engine, EnergyPlus provides more accuracy, fewer workarounds, and enables the analysis of the more innovative and complex mechanical system and building designs. DOE has been funding on-going improvements to the analysis capabilities of this powerful engine to increase its application for existing buildings and low-energy designs, as well as new-construction, conventional buildings. While, to date, EnergyPlus has been used primarily by researchers, an increasing number of programs are linking and developing interfaces to the EnergyPlus engine to provide users with the capability to analyze natural ventilation, ground source heat pumps, and radiant systems within their overall building designs.

Hourly Analysis Program (HAP)

Carrier's Hourly Analysis Program (HAP) is a versatile system design tool and an energy simulation tool in one package, with a Windows-based graphical user interface. HAP's design module uses a system-based approach to HVAC load estimating. This approach tailors sizing procedures and results to the specific type of system being considered. Calculation rigor and integrity are provided by the ASHRAE Transfer Function Method for calculating building heat flow (AIA 2012).

TRaNsient SYstem Simulation Program (TRNSYS)

TRNSYS Is a commercially-available, i.e., not free, Building Energy Modeling program whose modular system approach makes it one of the most flexible tools available. TRNSYS includes a graphical interface, a simulation engine, and a library of components that range from various building models to standard HVAC equipment to renewable energy and emerging technologies. TRNSYS also includes a method for creating new components that do not exist in the standard package. This simulation package has been used for HVAC analysis and sizing, multizone airflow analyses, electric power simulation, solar design, building thermal performance, analysis of control schemes, etc. (AIA 2012).

DesignBuilder™

DesignBuilder provides a user-friendly modeling environment, accommodating a range of environmental performance data, such as energy consumption, internal comfort data, and HVAC component sizes. The output is based on detailed sub-hourly simulation time steps (AIA 2012).

OpenStudio

Developed by the National Renewable Energy Laboratory, OpenStudio is an interface that provides users easy access to a number of building analysis engines. OpenStudio's reputation is in providing easier access to the energy analysis engine EnergyPlus, and increasingly, interfaces with other performance analyses engines such as Radiance for lighting, and CONTAM for airflow and air quality simulation. OpenStudio includes a SketchUp-type modeling capability that allows users to 'build'/specify geometry, space types, and thermal and lighting zones in a 3D modeling construct, similar to architectural 3D modeling programs (rather than the extruded floor-plan constructs of most energy modeling graphic interfaces.) It gives users access to editing building schedules, constructions, internal loads, and mechanical systems, with an intuitive, drag-and-drop interface and also includes basic visualization modules for viewing simulation results in more intuitive formats (AIA 2012).

Simergy

Simergy is the newly developed graphical interface for EnergyPlus, affording more user-types the ability to analyze design performance at different stages in the design process. In addition to analyzing alternatives related to building form, glazing percentage/type, exterior shading, and aspects of daylighting at early stages of design, Simergy also allows high-performance HVAC systems to be effectively included. A comprehensive set of templates and libraries for ASHRAE 90.1, LEED, California Title 24, and low energy HVAC systems allow the user to incorporate innovative HVAC systems, such as chilled beams with displacement ventilation, into the building energy model without questionable workarounds (AIA 2012).

IES® Virtual Environment

IES is an integrated suite of tools designed to allow building performance analysis to be easily integrated into commercial workflows across the entire design lifecycle. The APACHE engine is the core energy simulation component in all four of the Virtual Environment tiers (backed up by other engines for related performance analysis, such as Radiance for daylighting). In design mode, APACHE covers the calculation of heating, cooling, and latent room loads, the sizing of room units, internal comfort analysis, and codes/standards checks. In simulation mode, APACHE can operate at time-steps as small as one minute and performs a dynamic thermal simulation using hourly weather data. Integrated components of APACHE permit simultaneous simulation of HVAC plant, solar gains and shading, natural ventilation, and dimming strategies (AIA 2012).

TRACE® 700

Trane Air Conditioning Economics, or TRACE, is a design and analysis tool developed to help professionals optimize the design of a building's heating, ventilating, and air-conditioning system based on energy utilization and life-cycle cost. It is a complete load, system, energy, and economic analysis program that compares the energy and economic impact of building alternatives, such as architectural features, HVAC systems, building utilization, or scheduling and economic options. Users can choose from a large variety of systems, economizers, and plant configurations, including water-source and central or distributed ground-source systems, underfloor air distribution systems, dedicated outdoor-air systems, and optimized control strategies. TRACE 700 includes ASHRAE Standard 90.1 equipment and envelope libraries, gbXML imports, weather files, templates, Building Information Modeling, and more. TRACE 700 complies with Performance Rating Method of ASHRAE Standard 90.1-2007 for LEED analysis and was the first simulation software approved by the IRS for energy-savings certification (AIA 2012).

Energy-10 (engine)

Energy-10 is a Design Performance Modeling tool focused on making tradeoffs during early design phases for buildings that are less than 10,000 sqf. floor area, or buildings that can be treated as one- or two zone increments. Performs whole-building energy analysis for 8760 hours/year, including dynamic thermal and daylighting calculations. Specifically designed to facilitate the evaluation of energy-efficient building features in the very early stages of design (AIA 2012).



SAMER ELSAYARY

INTERNET of THINGS for ARCHITECTS

In our contemporary world of rapid advancing technology, we find ourselves facing every day new concepts that change our modern lifestyle.
Internet of things in its simplest terms is the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.

The term IoT can most likely be attributed to Kevin Ashton in 1997 with his work at Proctor and Gamble. The work brought him to Massachusetts Institute of Technology MIT in 1999 where he and a group of like-minded individuals started the Auto-ID center research consortium
The concept of things being connected to the Internet up through 2012 was primarily connected smartphones, tablets, PCs, and laptops. Essentially, things that first functioned in all respects as a computer. Up to the year 2000, most devices that were associated with the Internet were, as stated, not only computers of various sizes but also, they extended to include washing machines, smart TV, refrigerators and many home appliances…etc.

IoT potential in the Construction industry

The IoT will touch nearly every segment in industrial, enterprise, health, and consumer products. It is important to understand the impact, as well as why these disparate industries will be forced to change in the way they build products and provide services. Perhaps your role as an architect forces you to focus on one particular segment; however, it is helpful to understand the overlap with other use cases.

As previously mentioned, there is an opinion that the impact of IoT-related industries, services, and trade will affect the construction industry on various scales and operations of the whole life cycle of the building starting from the Construction equipment, facility management, sustainability, energy conservation, decreasing the carbon footprint to the renovation of the building or its demolition. It is expected that the role of IoT will extend to be integrated into the BIM industry with all its phases in the coming few years.

Some might think of IoT as a next generation of smart homes or intelligent systems in buildings. This approach might be right in terms of using technology to operate the Building with only one key difference. Using the internet and the building components being able to communicate with each other and with humans will be the next new leap. IoT devices can be used to monitor and control the mechanical, electrical and electronic systems used in various types of buildings (e.g., public and private, industrial, institutions, or residential) in home automation and building automation systems. In this context, three main areas are being covered in literature:

- The integration of the internet with the building energy management systems in order to create energy efficient and IOT has driven “smart buildings”.
- The possible means of real-time monitoring for reducing energy consumption and monitoring occupant behaviors.
- The integration of smart devices in the built environment and how they might be used in future applications.

As an architect in this new field, we have to expect a new kind of operations, design, and communication with the building equipped with IoT, artificial intelligence and smart systems. It will be a whole different world where architects and engineers will be needed to communicate with the building to make essential repairs or even to operate it properly.

IoT design is, by nature, a set of devices. The value of IoT is not a single device or a single location broadcasting data to a server. It’s a set of things broadcasting and exchanging data and understanding the value the information in aggregate is trying to tell the architect. where data is the trend of the century.

The IoT starts with the simplest of sensors located in the remotest corners of the earth and translates analog physical effects into digital signals (the language of the internet). Data then takes a complex journey through wired and wireless signals, various protocols, natural interference, and electromagnetic collisions, before arriving in the ether of the internet. From there, packetized data will traverse various channels arriving at a cloud or large data center. The strength of IoT is not just one signal from one sensor, but the aggregate of millions of sensors, events, and devices. Can a smart shutter of a window be connected to the climate database and operate after downloading the climatic data on a daily basis?

An architect must be able to speak to the value the design brings to a building. The architect must also play multiple engineering and product roles in balancing different design choices.

Significant numbers of energy-consuming devices (e.g. switches, power outlets, bulbs, televisions, etc.) already integrate internet connectivity, which can allow them to communicate with utilities to balance power generation and energy usage and optimize energy consumption as a whole.

These devices allow for remote control by users, or central management via a cloud-based interface, and enable functions like scheduling (e.g., remotely powering on or off heating systems, controlling ovens, changing lighting conditions etc.).The Smart grid is a utility-side IoT application; systems gather and act on energy and power-related information to improve the efficiency of the production and distribution of electricity. Using advanced metering infrastructure (AMI) internet-connected devices, electric utilities not only collect data from end-users but also manage distribution automation devices like transformers.

IoT merging into BIM

As indicated before the Internet of Things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these things to connect and exchange data, creating opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits and reduced human intervention.

By definition Building information modeling (BIM) is a process involving the generation and management of digital representations of physical and functional characteristics of places. Building information models(BIMs) are files (often but not always in proprietary formats and containing proprietary data) which can be extracted, exchanged or networked to support decision-making regarding a building or other built asset. Current BIM software is used by individuals, businesses and government agencies who plan, design, construct, operate and maintain diverse physical infrastructures, such as water, refuse, electricity, gas, communication utilities, roads, bridges, ports, tunnels, etc. So again both are centered around data management and both are based upon a database and the existence of the internet. This convergence in the two concepts enabled them to merge easily.

Both industries rely on the hardware, software, and services provided by the bulk of the IT industry. Nearly every major technology and/or construction company is investing or has invested heavily in IoT space and BIM. New markets and technologies have already formed (and some have collapsed or been acquired).

The Main principles of IoT

- Sensors: Embedded systems, real-time operating systems, energy-harvesting sources, Micro-Electro-Mechanical Systems (MEMs). The internet starts or ends with an event: a simple motion, a temperature change, perhaps an actuator moving on a lock. Unlike many IT devices in existence, IoT in a large part is about a physical action or event. It responds to affect a real-world attribute. Sometimes this involves considerable data being generated from a single sensor, such as auditory sensing for preventative maintenance of machinery. Other times, it's a single bit of data indicating humidity data from a certain location. When we talk about the billions of devices in IoT, this is what they are referring to and why there will be billions of devices in reality.

- Sensor communication systems: A significant role of IoT surrounds connectivity and networking. There are countless other sources that dive deep into application development, predictive analytics, and machine learning. The IoT wouldn't exist without significant technologies to move data from the remotest and most hostile environment to the largest data centers at Google, Amazon, Microsoft, and IBM. The acronym IoT contains the word internet, and because of that, we need to dive deep into networking, communications, and even signal theory. The starting point for IoT isn't sensors or the application; it's about connectivity. A successful architect will understand the constraints of internetworking from a sensor to a WAN and back again. Wireless personal area networks reach from 0 cm to 100 m. Low-speed and low-power communication channels, often non-IP based have a place in sensor communication.

- Local area networks: Typically, IP-based communication systems such as 802.11 Wi-Fi used for fast radio communication, often in peer-to-peer or star topologies.

- Aggregators, routers, gateways: Embedded systems providers, cheapest vendors (processors, DRAM, and storage), module vendors, passive component manufacturers, thin client manufacturers, cellular and wireless radio manufacturers, middleware.

The IoT from a perspective of Architectural design

As objects around us begin to collect data, it is possible that they may enable designs we could never think of. The IoT needs a new way of researching and designing that looks into the creative possibilities of the Internet of Things. It requires how to partner with intelligent things to expand design capabilities and envision new design solutions.

As a designer, you might be familiar with the technologies that enable IoT. But a fresh perspective is needed to fully understand the impact of these technologies in your design practice. Placing a sensor on a device is, for instance, more than just collecting data. A designer using this approach will ask: what can the sensor find out for me, and what new possibilities can it open up for my work?

You might find that smart mobility is not just about energy efficiency but also new social relations, or that technology for elder people is not so much about safety as it is about vitality and resourcefulness.

The IoT's major significant trend in recent years is the explosive growth of devices connected and controlled by the internet. The wide range of applications for IoT technology mean that the specifics can be very different from one device to the other though the basic characteristics shared by them. It is a new era where the communication of things can help us in seeing the world from a new perspective.

> *"The Internet of Things (IoT) starts with the simplest of sensors located in the remotest corners of the earth.*

Manage Revit Digital Content using Forge Design Automation API for REVIT



MOSTAFA SALAH

Introduction

Before we go through the objectives, we just wanted to cast some rays on what Forge Design Automation for Revit (a.k.a. Revit.io) is. So far, Revit.io is a private beta, which means that few people have access to such technology for testing and evaluation purposes. As announced in Autodesk University in Las Vegas 2018, the private beta will be for the public in the 28th of January 2019.

What is Forge Design Automation for Revit (Revit.io)?

Revit.io is part of the Forge Design Automation API for that lets you build web applications that create, read, and modify Revit models. It will allow developers to access the "business logic" of Revit on the cloud. Like Design Automation API for AutoCAD, developers can create client applications, which speak to the Revit engine via REST API. Developers will be able to automate existing workflows or create new cloud workflows. Because Design Automation API for Revit is a Forge service, we can take advantage of other forge services to easily connect our applications together.

What are some examples of what the service can do?
There are many options falling under three major workflows: Create, Extract, and Modify.
Create
- Convert from a third-party format to RVT/RFA
- Generate documentation from a specification
- Create families from a catalog

Extract
- Put data into a format Revit doesn't natively support
- Share model info with consultants who don't have Revit
- Create daily model reports

Modify
- Design option generation
- Automatically replace out-of-date content
- Fix common modeling mistakes

Revit.io Model

Like other Forge services, you will create a Forge client application, which will call the REST API endpoints. You can use any language, which can make REST calls. This client application will also do any "front-end" work you need – displaying UI to an end-user, for example.
In addition to the client application, we will create one or more Revit add-ins to execute against the Revit engine. They will be uploaded to the Design Automation service and your client application will refer to them when invoking the service. They can be kept private or public depending on what you want.

The real advantage is since the DA is a part of the Autodesk Forge platform that works on the cloud then you can make your add-in more powerful by giving it unlimited access to all other cloud service providers.
By connecting to other cloud services, you can use advanced features like Lambda functions from Amazon and even plug your add-in to the ML and AI provided from Microsoft or Google for example.

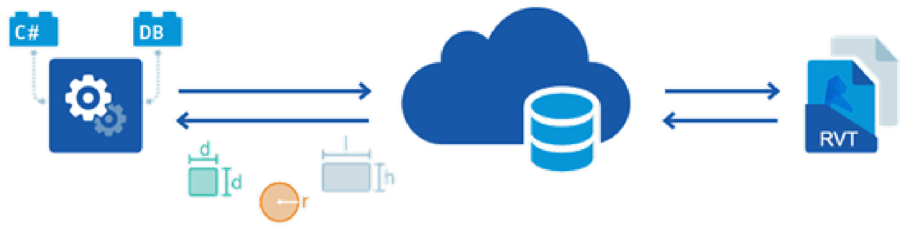


Fig.1 Architecture of Revit.io

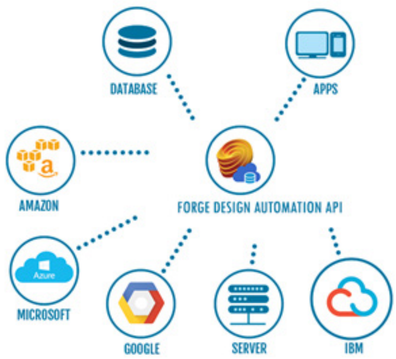
Terminology:

There is some important terminology, which we should be aware of, to be able to develop the application.
Design Automation, Design Automation for Revit, DA, DA4R, and Revit.io will be used interchangeably to refer to the same thing.

Why Revit.io?

There is no difference between writing code using the DA API and writing the code for a regular Revit add-in, they are almost equivalent except that in DA you don't have access to the UI components to the Revit interface and you only limited to address the DB.

Fig.2 Revit.io integration with cloud-platforms



The harmonization between a digital operating model, predictive analytics, and a microservices architecture allows digital organizations to quickly take customer desires and feedback and turn them into actionable, revenue-generating business solutions. As Artificial Intelligence or AI becomes more prevalent in business applications, these organizations use rudimentary machine learning to improve decision making in big data analysis.

Cloud-based content management with automated client requirements and standardization

By using DA4R we will be able to build a Revit integrated cloud-based Revit content management platform that helps us to produce healthier, higher quality models faster.
This helps Digital Managers to organize and control the quality of their Revit family libraries.

How it works

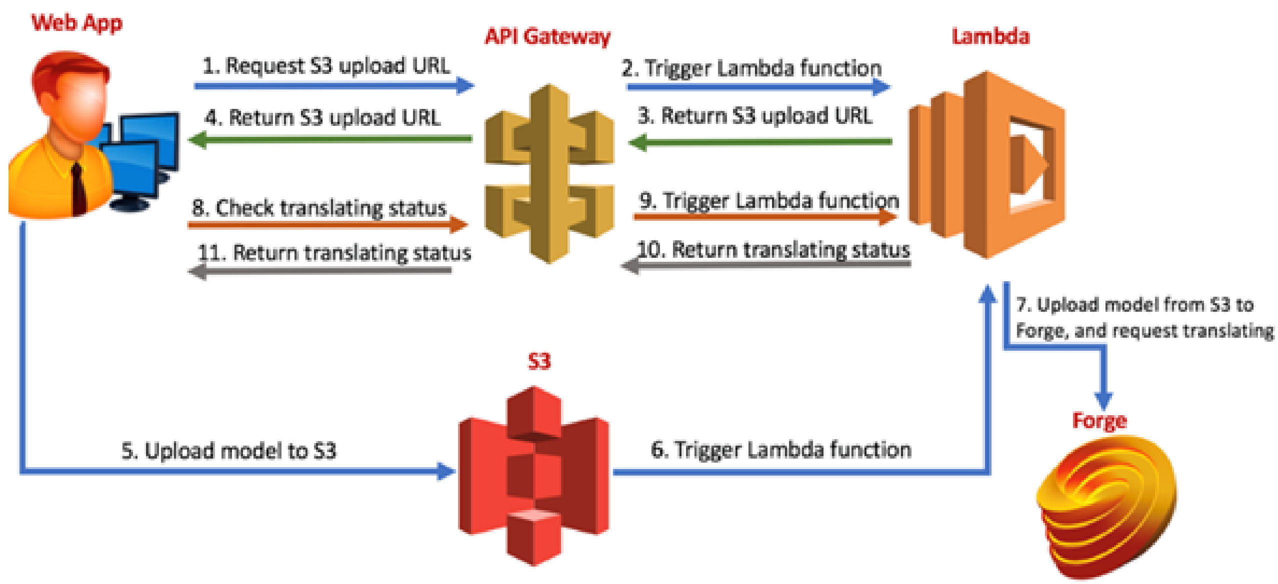
The first step is to upload the Revit model to the portal. Once the upload process is done the Web App will send a copy of the Revit file to the Revit.io engine and trigger the Families extraction add-in. As soon as DA4R finishes the extraction, it will save the Families into folders named after their Category names. As the DA4R only will allow us to get the result of our processing in the form of a single file, then we need to zip all the folders into a single archive.
The archived categorized families will then be uploaded to an AWS bucket where we will make benefit from the Amazon S3 services and the Lambda functions. After the upload is complete, we will use Lambda function to trigger an extraction process, which will unzip the contents into another bucket

Whenever the extraction is finished, another Lambda function will be triggered to upload the extracted families into their related buckets in the Forge associated buckets.

Applying the corporate standard to the families like file name convention, validating the families or testing the parameters can take place at any stage after the extraction, either by triggering another Lambda function or at your Web App after the Families are uploaded to the Forge buckets.

> *Revit.io is part of the Forge Design Automation API for that lets you build web applications that create, read, and modify Revit models.*

Fig.3 Revit.io integration with cloud-platforms



Advantages

By connecting to Cloud-Services from different vendors, you can improve your web application by integrating many Machine Learning and AI algorithms with it.

This will help you quickly build projects by getting suggestions from the ML about the Families you need to use or optimum design layout and building orientation for instance. As you are keeping all your content in one place, you have a Single point of truth where everything is up-to-date and sanitized. In addition, that will make you sure of templates consistency.

Conclusion

With new technologies constantly emerging, companies need to be at the forefront in order to continue providing competitive and relevant offerings to their clients. The evolution of the AEC industry dictates a shift in which companies need to adapt to such changes. The recent development and deployment of Building Information Modelling (BIM), for example, emphasizes the importance of such endeavors.
By finding a way to glue the new technologies with the BIM standards, we can say that Revit.io is the best technology to do so. As this technology is still evolving we expect more and more in the future to come.

BIM usage to model the existing Infrastructure for PROJECTS

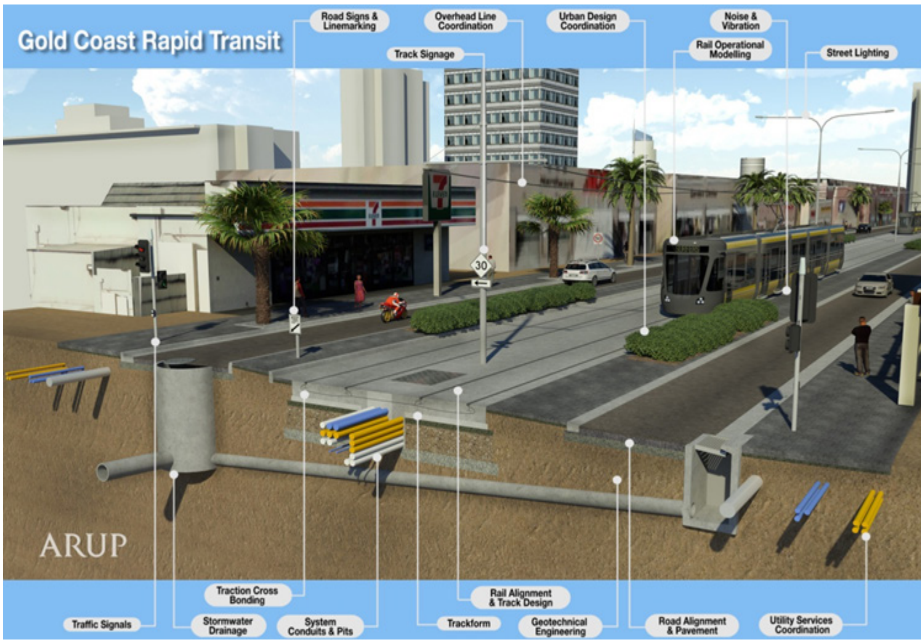


AYMAN KANDEEL

What is the existing infrastructure for projects?

Existing infrastructure projects can consist of simple utilities which face designers during the expansion of an existing building or expand to a huge utilities networks which face designers when designing a complete infrastructure network for a city. Most of these designs may be based on beliefs and guesses due to the lack of complete information and documentation of those services which can serve designers in the BIM model.

Therefore, the management of infrastructure projects based on the existence of current utilities networks is difficult to deal with, especially in the absence of information. The idea of solving the problem from the perspective of BIM is to document all the existing services and give them the actual characteristics (dimensions - materials - Levels - etc.), which allows designers to deal with the existing utilities infrastructure an intelligent elements and a part of the model.



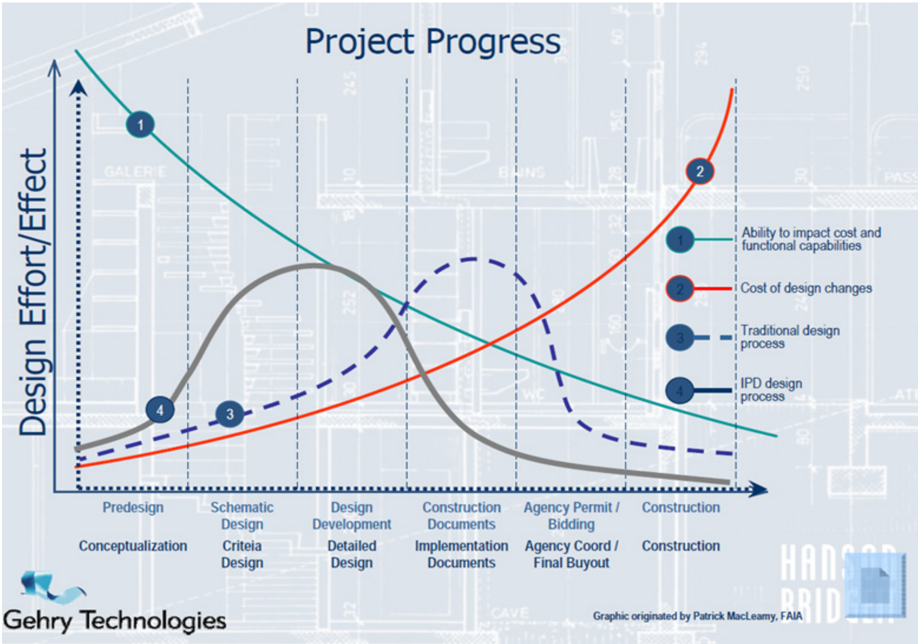
Can designers apply BIM to existing infrastructure projects?

Project owners seeking the lowest risk possible when implementing the project, which requires the necessity of predicting and correcting the status of the site so as not to be a surprise during construction. One of the BIM objectives is reducing the costs of design change and imitate changes in the pre-construction phase as shown in the below figure.

So BIM if correctly implemented in modeling the existing infrastructure can help predicting:

1.Where are risks?
2.Changes in design before construction phase.
3.Quantity survey and cost control according to the existing infrastructure.
4.Achieving beneficial integration results especially in the construction phase.
5.Achieve the correct path of the new infrastructure utilities design to serve them and does not conflict with the existing one.

> *If a building is worth building, it worths building twice, once digitally during the design process and again physically during the construction process.*



How to represent existing infrastructure elements for projects?

This can be achieved through traditional methods by collecting data and as built drawings, and prepare drawings to be used in BIM, This method depends on the accuracy of the information and the implementation according to those plans, which may be required to modify the existing designs to achieve better standards of accuracy.

It may require to use one of the modern technology methods to obtain a comprehensive survey of the current situation, but disadvantages are high costs and special technology is required such as laser scanning.

The point is to compile a three-dimensional matrix of all the points that collide with the laser beam and forms a network of the points to form the current situation and it is very effective in complex details.

BIM application results in the existing infrastructure:

I.Design stage:

a.Ease to export all data and details of the model.

b.Extracting data from the approved model reduces the probability of errors.

c.All data are available for all disciplines at the same time.

d.Ease of review procedures to achieve efficiency throughout the design cycle.

II.Construction stage:

a.Ease to quaintly survey and prepare invoices.

b.Integration with design during construction.

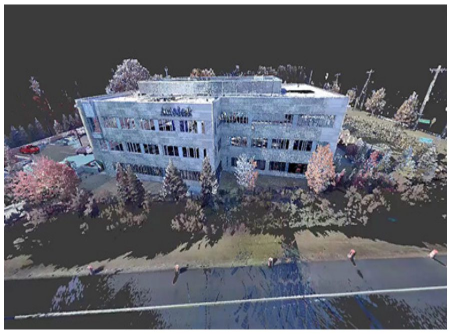


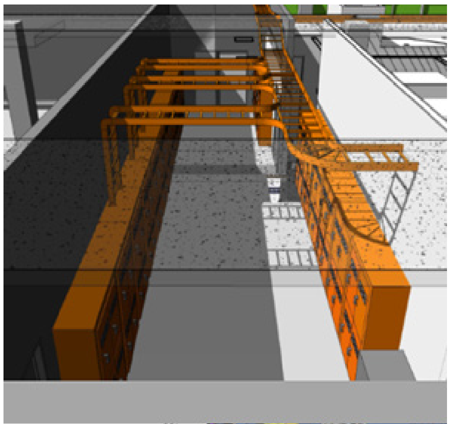


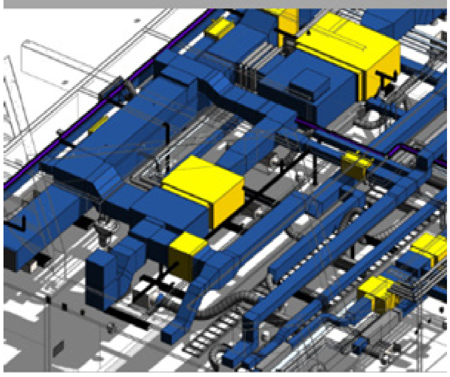
c.Flexibility of work and provide alternative solutions during construction.

Infrastructure projects and Autodesk Infraworks 360™ program

To start using BIM on infrastructure projects, you need to start by creating a model of the current conditions which can help accelerate the entire project. In contrast with conventional drawing, which often lack sufficient detail to contribute to later stages of projects in the BIM process, the existing infrastructure model should be three-dimensional with all the descriptive information of the elements such as (depth, height, diameter, material) and all required data.

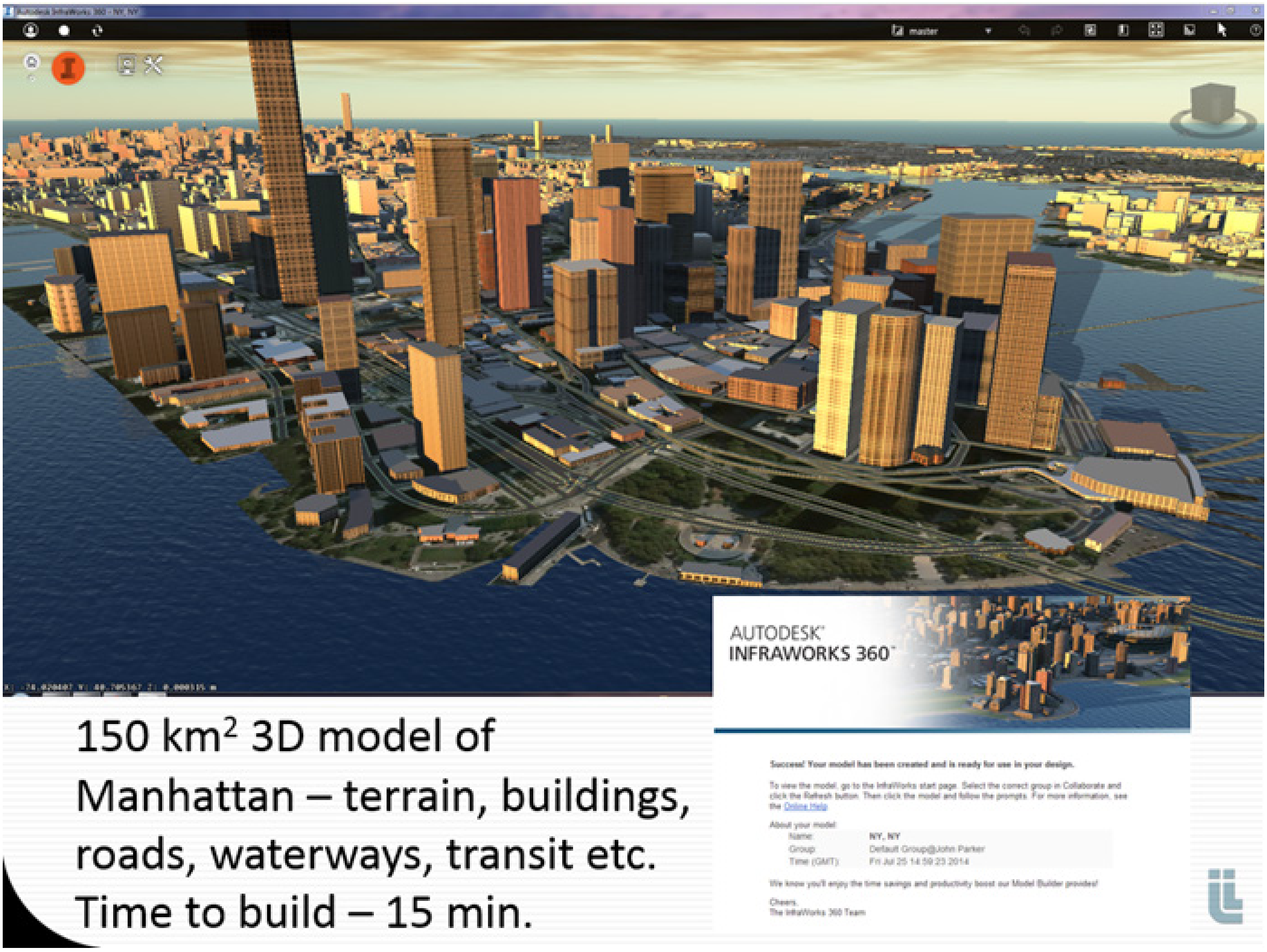






The process of creating a model for the existing structure in Autodesk 360 Autodesk ™ is a simple and quick. Once you have chosen the place to study and start the preliminary study of the design proposals, the program can give you a topographic surface of the area under study by using an accurate aerial images from Bing maps as well as all existing roads, railways, buildings and water surfaces through model builder feature in 360 versions, Program named due to its strength in modeling the reality, the schematic design and decision support for roads, bridges and drainage.

The program enables you to add all the other designs, water and drainage systems, residential buildings and facilities that are being designed and to create a real environment of the project by adding smart elements that give the spirit of realism of the model and this strong technology considers an important element towards moving to a better future in the smart cities.


AUTODESK®
INFRAWORKS 360™
150 km² 3D model of Manhattan – terrain, buildings, roads, waterways, transit etc.
Time to build – 15 min.
Success! Your model has been created and is ready for use in your design.
To view the model, go to the InfraWorks start page. Select the correct group in Collaborate and click the Refresh button. Then click the model and follow the prompts. For more information, see the Online Help.
About your model:
Name: NY, NY
Group: Default Group@John Parker
Time (GMT): Fri Jul 25 14:59:23 2014
We know you'll enjoy the time savings and productivity boost our Model Builder provides!
Cheers,
The InfraWorks 360 Team





A Warm
CONGRATULATIONS!

Congratulations to my older brother,

Moaz Abu Zeid
Architect- Fine Arts Alexandria

winning the award of the best young architect in the Middle East for the year 2016.

And

Islam Mashtoli
Engineer-Shubra Engineering

winner of the award in 2015

A clear message that there is hope and the defect is not in us. We have the ability to excel and succeed.



COMPETITION

Our mission was to spread science and Arabization because it is the path of our leadership.

So as to encourage writing and in agreement with **BIM SOFT SOLUTIONS**

We have made a free prize of

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Not to have been written in the magazine in advance and any reader of the magazine buys any tool can choose one second free once he sends a message to **bim_s_s@yahoo.com** entitled

"BIMarabia"

BIMarabia Message

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Omar Selim
Founder | General manager

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